Nelson Mathematics 5

Teacher's Resource

Ontario Supplement

Series Authors and Senior Consultants
Mary Lou Kestell • Marian Small

Senior Authors
Heather Kelleher • Kathy Kubota-Zarivnij • Pat Milot • Betty Morris • Doug Super

Supplement Authors
Lynda Cowan • Margaret McClintock • Elizabeth Salomons

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Senior Authors
Heather Kelleher, Kathy Kubota-Zarivnij, Pat Milot, Betty Morris, Doug Super

Student Book Authors
Carol Adam, Jennifer Brown, Carol Brydon, Anne Cirillo, Andrea Dickson, Roz Doctorow, Wendy Dowling, Catharine Gilmour, Elizabeth Grill-Donovan, Jack Hope, Wendy Klassen, Kathy Kubota-Zarivnij, David Leach, Pat Margerm, Gail May, Pat Milot, Scott Sincerbox, Marian Small, Ian Stackhouse, Mary Steele, Susan Stuart, Debbie Sturgeon, Rosita Tseng-Tam

Assessment Consultant
Damian Cooper

Supplement Authors
Lynda Cowan
Margaret McClintock
Elizabeth Salomons

Director of Publishing
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Vicki Gould

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For more information contact Nelson, 1120 Birchmount Road, Toronto, Ontario, M1K 5G4. Or you can visit our Internet site at http://www.nelson.com

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Introduction

This supplement is designed to align Nelson Mathematics to the 2005 Ontario Curriculum.
Nelson Mathematics is built on a sound research foundation (see *Mathematics Education: A Summary of Research, Theories, and Practice* available at any Teacher Centre on the Nelson Mathematics Web site). The instructional design, including the integration of assessment and evaluation, is congruent with current best practice.

Organization of the Ontario Supplement for *Nelson Mathematics 5*

The Chapter Planning Charts in this supplement provide
- expectations addressed in each lesson and Chapter Task
- teaching suggestions for adapting existing lessons
- identification of lessons that are not required for the grade expectations
- identification of lessons that are beyond the grade expectations
- references to new lessons

Following the Planning Charts are the new student lessons to address new expectations, each followed by the related teaching notes.

Note: Parts of expectations that are inside square brackets are addressed in other lessons.

Chapter 1 Planning Chart: Patterns in Mathematics

<table>
<tr><th>Content</th><th>Expectations</th><th>Addressing Expectations</th></tr>
<tr><td>Getting Started: Patterns in Phone Chains, pp. 2–3</td><td></td><td>Assessment Opportunity</td></tr>
<tr><td>Lesson 1: 2-D Patterns, pp. 4–5</td><td>• determine, through investigation using a table of values, relationships in growing [and shrinking] patterns, [and investigate repeating patterns involving translations]
– create, identify, and extend numeric and geometric patterns, using a variety of tools
– make a table of values for a pattern that is generated by adding or subtracting a number (i.e., a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence or the pattern rule in words
– make predictions related to growing [and shrinking] geometric and numeric patterns</td><td></td></tr>
<tr><td>Mental Math: Subtracting from Hundreds, p. 5</td><td></td><td></td></tr>
<tr><td>Lesson 2: Patterns in Tables, pp. 6–7</td><td>• determine, through investigation using a table of values, relationships in growing and shrinking patterns, [and investigate repeating patterns involving translations]
– create, identify, and extend numeric [and geometric] patterns, using a variety of tools
– make a table of values for a pattern that is generated by adding or subtracting a number (i.e., a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence or the pattern rule in words
– make predictions related to growing and shrinking [geometric and] numeric patterns</td><td>Teaching and Learning: Extend the lesson to include shrinking patterns.
Sample Discourse
"Suppose Glynis wasn't sure how many people would be at the party. She bought 4 L of juice and used a table to keep track of how much juice was left:
<table><tr><th>Number of people served</th><th>Juice left (L)</th></tr><tr><td>0</td><td>4.0</td></tr><tr><td>1</td><td>3.6</td></tr><tr><td>2</td><td>3.2</td></tr><tr><td>3</td><td>2.8</td></tr></table>What is the rule for this shrinking pattern? Extend the table for 8 people. If 12 people come to the party, will she have enough juice?"
Have students make a table of values based on a decreasing number sequence (e.g., 18, 16, 14, …) or a rule for a pattern generated by subtracting a number (e.g., start at 48 and subtract 6 each time).</td></tr>
<tr><td>Lesson A: Building a Model, Supplement, pp. 24–25</td><td>• determine, through investigation using a table of values, relationships in growing and shrinking patterns, [and investigate repeating patterns involving translations]
– build a model to represent a number pattern presented in a table of values that shows the term number and the term
– make a table of values for a pattern that is generated by adding or subtracting a number (i.e., a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence or the pattern rule in words</td><td>New Lesson</td></tr>
<tr><td>Lesson 3: Solve Problems Using Patterns, pp. 8–9</td><td>– create, identify, and extend numeric and geometric patterns, using a variety of tools
– make predictions related to growing [and shrinking] geometric and numeric patterns</td><td></td></tr>
<tr><td>Mid-Chapter Review: p. 10</td><td></td><td>Assessment Opportunity</td></tr>
<tr><td>Curious Math: The Braille Alphabet, p. 11</td><td></td><td>Optional</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Content	Expectations	Addressing Expectations
Lesson 4: 3-D Patterns, pp. 12–13	• determine, through investigation using a table of values, relationships in growing [and shrinking] patterns, [and investigate repeating patterns involving translations] – create, identify, and extend numeric and geometric patterns, using a variety of tools – make a table of values for a pattern that is generated by adding [or subtracting] a number (i.e., a constant) to get the next term, [or by multiplying or dividing by a constant to get the next term], given either the sequence or the pattern rule in words – make predictions related to growing [and shrinking] geometric and numeric patterns	
Curious Math: Adding Squares, p. 13		Optional
Lesson 5: Number Patterns in Spreadsheets. pp. 14–15	• determine, through investigation using a table of values, relationships in growing [and shrinking] patterns, [and investigate repeating patterns involving translations] – create, identify, and extend numeric [and geometric] patterns, using a variety of tools – make a table of values for a pattern that is generated by adding or subtracting a number (i.e., a constant) to get the next term, or by multiplying or dividing by a constant to get the next term, given either the sequence or the pattern rule in words	
Lesson B: Variables in Expressions, Supplement, pp. 27–28	• demonstrate, through investigation, an understanding of the use of variables [in equations] – demonstrate, through investigation, an understanding of variables as changing quantities, given equations with letters or other symbols that describe relationships involving simple rates	New Lesson
Lesson C: Solving Equations, Supplement, pp. 30–31	• demonstrate, through investigation, an understanding of the use of variables in equations – demonstrate, through investigation, an understanding of variables as unknown quantities represented by a letter or other symbol – determine the missing number in equations involving addition, subtraction, multiplication, or division and one- or two-digit numbers, using a variety of tools and strategies	New Lesson
Skills Bank: pp. 16–17		
Problem Bank: pp. 18–19		
Chapter Review: pp. 20–21		Assessment Opportunity
Chapter Review: Supplement, p. 33		New Assessment Opportunity
Chapter Task: Patterns in Building, p. 22	• determine, through investigation using a table of values, relationships in growing [and shrinking] patterns, [and investigate repeating patterns involving translations] – create, identify, and extend numeric [and geometric] patterns, using a variety of tools – make predictions related to growing [and shrinking] geometric and numeric patterns	Assessment Opportunity

Chapter 2 Planning Chart: Numeration

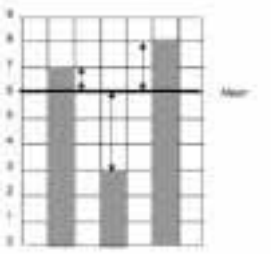
Content	Expectations	Addressing Expectations
Getting Started: Modelling and Comparing Numbers, pp. 24–25		Assessment Opportunity Reading words to three thousand goes beyond Grade 4 curriculum. Modify Question 2 by replacing the word thousand with hundred. Naming decimals to hundredths goes beyond Grade 4 curriculum. Replace Question 3 by having students identify the decimal represented by fraction strips showing $\frac{2}{10}$ and $\frac{7}{10}$ shaded.
Lesson 1: Estimating 50 Thousand, p. 26	• read, represent, [compare, and order] whole numbers to 100 000, [decimal numbers to hundredths, proper and improper fractions, and mixed numbers] – represent, [compare, and order] whole numbers [and decimal numbers from 0.01 to 100 000,] using a variety of tools – solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 100 000	
Curious Math: Keep On Doubling, p. 27		Optional
Curious Math: Lots of Money, p. 27		Optional
Lesson 2: Reading and Writing Numbers, pp. 28–30	• read, represent, compare, and order whole numbers to 100 000, [decimal numbers to hundredths, proper and improper fractions, and mixed numbers] – represent, compare, and order whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools – demonstrate an understanding of place value in whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools and strategies – read and print in words whole numbers to ten thousand, using meaningful contexts – solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 100 000	Reading number words beyond ten thousand is beyond Grade 5 curriculum. Some numbers in this lesson go beyond ten thousand but not beyond five digits. However, students may encounter these words in reading and research. Guide any students who may have difficulty reading "sixteen thousand eight hundred fifty-four" in Aaron's Models. You may want to omit or modify Questions 4 a), 5, 6 a), and 7 a).
Mental Math: Multiply Numbers Close to Tens and Hundreds, p. 31		Optional
Lesson 3: Renaming Numbers, pp. 32–33	• read, represent, [compare, and order] whole numbers to 100 000, [decimal numbers to hundredths, proper and improper fractions, and mixed numbers] – represent, [compare, and order] whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools – demonstrate an understanding of place value in whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools and strategies – solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 100 000	
Curious Math: Easy as 1, 2, 3, p. 33		Optional
Lesson 4: Comparing and Ordering Numbers, pp. 34–35	• read, represent, compare, and order whole numbers to 100 000, [decimal numbers to hundredths, proper and improper fractions, and mixed numbers] – represent, compare, and order whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools – demonstrate an understanding of place value in whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools and strategies – solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 100 000	
Lesson 5: Rounding Numbers, pp. 36–37	• read, represent, compare, and order whole numbers to 100 000, [decimal numbers to hundredths, proper and improper fractions, and mixed numbers] – represent, compare, and order whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools – round four-digit whole numbers to the nearest ten, hundred, and thousand, in problems arising from real-life situations	Rounding five-digit whole numbers to the nearest ten thousand, thousand, and hundred is not specified in the Grade 5 curriculum, but is an important part of number sense. This lesson builds on rounding to four digits in Grade 4.

Content	Expectations	Addressing Expectations
Lesson 6: Communicate About Numbers in the Media, pp. 38–40	• read, represent, compare, and order whole numbers to 100 000, [decimal numbers to hundredths, proper and improper fractions, and mixed numbers] – represent, compare, and order whole numbers [and decimal numbers from 0.01] to 100 000, using a variety of tools – solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 100 000	
Mental Math: Adding by Bridging, p. 40		Optional
Mid-Chapter Review: p. 41		Assessment Opportunity
Lesson 7: Decimal Hundredths, pp. 42–43	• read, represent, compare, and order [whole numbers to 100 000,] decimal numbers to hundredths, [proper and improper fractions, and mixed numbers] • demonstrate an understanding of magnitude by counting forward and backwards by 0.01 – represent, compare, and order [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools – demonstrate an understanding of place value in [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools and strategies – count forward by hundredths from any decimal number expressed to two decimal places, using concrete materials and number lines	Reading and writing decimal numbers in words is not specifically mentioned in the Grade 5 curriculum. However, it can be included to enhance understanding of decimals. ***Teaching and Learning:*** Extend the lesson to include counting forward and backward by hundredths. Students can use a metre stick or tape measure as a concrete number line.
Lesson 8: Exploring Equivalent Decimals, p. 44	• read, represent, compare, and order [whole numbers to 100 000,] decimal numbers to hundredths, [proper and improper fractions, and mixed numbers] – represent, compare, and order [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools – demonstrate an understanding of place value in [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools and strategies – demonstrate and explain equivalent representations of a decimal number, using concrete materials and drawings	
Math Game: Decimal Snap, p. 45		Optional
Lesson 9: Rounding Decimals, pp. 46–47	• read, represent, compare, and order [whole numbers to 100 000,] decimal numbers to hundredths, [proper and improper fractions, and mixed numbers] • demonstrate an understanding of magnitude by counting forward and backwards by 0.01 – represent, compare, and order [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools – demonstrate an understanding of place value in [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools and strategies – round decimal numbers to the nearest tenth, in problems arising from real-life situations – count forward by hundredths from any decimal number expressed to two decimal places, using concrete materials and number lines	***Teaching and Learning:*** Extend the lesson to include counting forward and backward by hundredths. Have students count up or down by 0.01 from the decimal hundredth to the rounded decimal. Students can use a metre stick or tape measure as a concrete material and number line.
Lesson 10: Comparing and Ordering Decimals, pp. 48–49	• read, represent, compare, and order [whole numbers to 100 000,] decimal numbers to hundredths, [proper and improper fractions, and mixed numbers] – represent, compare, and order [whole numbers and] decimal numbers from 0.01 [to 100 000], using a variety of tools – demonstrate an understanding of place value in whole numbers and decimal numbers from 0.01 [to 100 000], using a variety of tools and strategies	
Lesson 11: Counting Money, pp. 50–51	• read, represent, compare, and order whole numbers to 100 000, decimal numbers to hundredths, [proper and improper fractions, and mixed numbers] – represent, compare, and order whole numbers and decimal numbers from 0.01 to 100 000, using a variety of tools – read and write money amounts to $1000	
Chapter 9 Lesson 2: Multiplying by 10 or 100 Use this lesson here.	– multiply decimal numbers by 10, 100, 1000, and 10 000, [and divide decimal numbers by 10 and 100,] using mental strategies	Use Chapter 9 Lesson 2 here. ***Teaching and Learning:*** Extend this lesson to include multiplying decimals by 1000 and 10 000. Review 100 cm = 1 m and 1000 m = 1 km. Then have students multiply Drake's arm measurement by 1000 and 10 000. **Sample Discourse** "How long is Drake's arm in metres? "(*0.5 m*)" If Drake's billboard arm were 1000 times the length of his real arm, how many metres long would his billboard arm be? "(*500 m*)" If it were 10 000 times as long, how many metres long would it be? "(*5000 m*)" How many kilometres is that? "(*5 km*)" Students can repeat these extensions using their own arm measurement.

Content	Expectations	Addressing Expectations
Chapter 10 Lesson 2: Dividing by 10 Use this lesson here.	– [multiply decimal numbers by 10, 100, 1000, and 10 000, and] divide decimal numbers by 10 and 100, using mental strategies	Use Chapter 10 Lesson 2 here. ***Teaching and Learning:*** Extend this lesson to include dividing decimals by 100. On the chalkboard, write 11.3 × 100 = 1130.0 11.3 × 10 = 113.0 11.3 × 1 = 11.3 11.3 ÷ 10 = 1.13 11.3 ÷ 100 = ■ **Sample Discourse** "What is the same in all these numbers?" (*the digits—except for zero(s)—and the position of the decimal point*)" What do you think 11.3 ÷ 100 equals?" (*0.113*) What does the digit in the first place after the decimal point represent? "(*1 tenth*)" What about the digit two places to the right? "(*1 hundredth*)" What do you think the digit three places to the right represents? "(*3 thousandths*)" Have students practise dividing a variety of decimal tenths by 100.
Skills Bank: pp. 52–54		For Lessons 9.2 and 10.2, select from Questions 4–6, p. 262; and Questions 3–7, p. 292.
Problem Bank: p. 55		For Lessons 9.2 and 10.2, select from Questions 3–5, pp. 264–265; and Questions 2–3, p. 295.
Chapter Review: pp. 56–57		Assessment Opportunity For Lessons 9.2 and 10.2, select from Questions 3–5, p. 254; Questions 4–5, p. 266; Questions 2–3, p. 284; and Questions 2–4, p. 296.
Chapter Task: Guess That Number, p. 58	• read, represent, compare, and order whole numbers to 100 000, decimal numbers to hundredths, [proper and improper fractions, and mixed numbers] – represent, compare, and order whole numbers and decimal numbers from 0.01 to 100 000, using a variety of tools – demonstrate an understanding of place value in whole numbers and decimal numbers from 0.01 to 100 000, using a variety of tools and strategies – read and print in words whole numbers to ten thousand, using meaningful contexts	Assessment Opportunity

Chapter 3 Planning Chart: Data Management

Content	Expectations	Addressing Expectations
Getting Started: Graphing Favourite Authors, pp. 60–61		Asssessment Opportunity Use prompts A–D, Questions 2–3.
Lesson 1: Evaluating Survey Results, pp. 62–63	• collect and organize discrete [or continuous] primary data [and secondary data] and display the data using charts and graphs, [including broken-line graphs] • read, describe, and interpret primary data [and secondary data] presented in charts and graphs, [including broken-line graphs] – collect data by conducting a survey or an experiment to do with themselves, their environment, issues in their school or community, or content from another subject, and record observations or measurements – collect and organize discrete [or continuous] primary data [and secondary data] and display the data in charts, tables, and graphs (including broken-line graphs) that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools – demonstrate an understanding that sets of data can be samples of larger populations – read, interpret, and draw conclusions from primary data [and from secondary data], presented in charts, tables, and graphs [(including broken-line graphs)]	***Teaching and Learning:*** Define discrete data.
Mental Math: Multiply Numbers by Five, p. 63		Optional
Lesson 2: Broken-Line Graphs, pp. 64–66	• [collect and] organize discrete or continuous [primary data and] secondary data and display the data using charts and graphs, including broken-line graphs • read, describe, and interpret [primary data and] secondary data presented in charts and graphs, including broken-line graphs – [collect and] organize discrete or continuous [primary data and] secondary data and display the data in charts, tables, and graphs (including broken-line graphs) that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools – read, interpret, and draw conclusions [from primary data and] from secondary data, presented in charts, tables, and graphs (including broken-line graphs) – compare similarities and differences between two related sets of data, using a variety of strategies	***Teaching and Learning:*** Define continuous data.
Lesson 3: Interpreting Circle Graphs, p. 67		Beyond Grade 5 curriculum
Lesson 4: Bar Graphs with Intervals, pp. 68–69		Beyond Grade 5 curriculum
Lesson 5: Pictographs, pp. 70–72	• [collect and] organize discrete [or continuous primary data and] secondary data and display the data using charts and graphs, [including broken-line graphs] – [collect and] organize discrete [or continuous primary data and] secondary data and display the data in charts, tables, and graphs [(including broken-line graphs)] that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools	Pictographs are not specifically mentioned in the Grade 5 curriculum. However, they are used in this lesson because they are particularly well-suited for the analysis of scale.
Mid-Chapter Review: p. 73		Assessment Opportunity Use Questions 1–2, 4.
Lesson 6: Changing the Appearance of a Graph, pp. 74–76	• [collect and] organize discrete [or continuous primary data and] secondary data and display the data using charts and graphs, [including broken-line graphs] • read, describe, and interpret [primary data and] secondary data presented in charts and graphs, including broken-line graphs – [collect and] organize discrete [or continuous primary data and] secondary data and display the data in charts, tables, and graphs [(including broken-line graphs)] that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools – read, interpret, and draw conclusions from [primary data and from] secondary data, presented in charts, tables, and graphs (including broken-line graphs) – compare similarities and differences between two related sets of data, using a variety of strategies	Optional. This lesson provides additional practice with scale and an opportunity to compare two different displays of the same data.

Content	Expectations	Addressing Expectations
Lesson 7: Graphing with Technology, p. 77	• collect and organize discrete [or continuous] primary data [and secondary data] and display the data using charts and graphs, [including broken-line graphs] • read, describe, and interpret primary data [and secondary data] presented in charts and graphs, including broken-line graphs – collect data by conducting [a survey or] an experiment to do with themselves, their environment, issues in their school or community, or content from another subject, and record observations or measurements – collect and organize discrete [or continuous] primary data [and secondary data] and display the data in charts, tables, and graphs [(including broken-line graphs)] that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools – read, interpret, and draw conclusions from primary data [and from secondary data], presented in charts, tables, and graphs [(including broken-line graphs)]	Use prompts A–E, and Question 1.
Lesson 8: Mean and Mode, pp. 78–79	• read, describe, and interpret primary data and secondary data presented in charts and graphs, including broken-line graphs – read, interpret, and draw conclusions from primary data and from secondary data, presented in charts, tables, and graphs (including broken-line graphs) – calculate the mean for a small set of data and use it to describe the shape of the data set across its range of values, using charts, tables, and graphs	***Teaching and Learning:*** Have students locate the mean on a graph and describe how the data looks compared to the mean. Select a graph where the mean will be a whole number; for example: 
Lesson A: Collecting Data, Supplement, p. 35	• estimate, measure, and record [perimeter, area,] temperature change, and elapsed time, using a variety of strategies • collect and organize [discrete or] continuous primary data [and secondary data] and display the data using charts and graphs, including broken-line graphs • read, describe, and interpret primary data [and secondary data] presented in charts and graphs, including broken-line graphs – measure and record temperatures to determine and represent temperature changes over time – describe, through investigation, how a set of data is collected and explain whether the collection method is appropriate – collect and organize [discrete or] continuous primary data [and secondary data] and display the data in charts, tables, and graphs (including broken-line graphs) that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools	New Lesson
Lesson 9: Communicate About Graphs, pp. 80–81	• read, describe, and interpret primary data and secondary data presented in charts and graphs, including broken-line graphs – read, interpret, and draw conclusions from primary data and from secondary data, presented in charts, tables, and graphs (including broken-line graphs)	
Curious Math: Identifying the Mode on a Stem-and-Leaf Plot, p. 82		Optional
Math Game: Tossing Modes, p. 83		Optional
Skills Bank: pp. 84–85		Use Questions 1–2, 4–6.
Problem Bank: pp. 86–87		Use Questions 1, 3–7.
Chapter Review: pp. 88–89		Assessment Opportunity Use Questions 1, 3–5.
Chapter Task: Swimsuit Sales, p. 90	• [collect and] organize discrete [or continuous primary data and] secondary data and display the data using charts and graphs, including broken-line graphs • read, describe, and interpret primary data and secondary data presented in charts and graphs, including broken-line graphs – [collect and] organize discrete or continuous primary data and secondary data and display the data in charts, tables, and graphs (including broken-line graphs) that have appropriate titles, labels, and scales that suit the range and distribution of the data, using a variety of tools – read, interpret, and draw conclusions from primary data and from secondary data, presented in charts, tables, and graphs (including broken-line graphs)	Assessment Opportunity
Chapters 1–3 Cumulative Review: pp. 91–92		Assessment Opportunity

Chapter 4 Planning Chart: Addition and Subtraction

Content	Expectations	Addressing Expectations
Getting Started: Going to the Movies, pp. 94–95		Assessment Opportunity
Lesson 1: Adding and Subtracting Using Mental Math, p. 96	– solve problems involving the addition, subtraction, [and multiplication] of whole numbers, using a variety of mental strategies	
Curious Math: Open Sentences, p. 97		
Lesson 2: Estimating Sums and Differences, pp. 98–99	– use estimation when solving problems involving the addition, subtraction, [multiplication, and division] of whole numbers, to help judge the reasonableness of a solution	
Lesson 3: Adding Whole Numbers, pp. 100–101	– solve problems involving the addition, [subtraction, and multiplication] of whole numbers, using a variety of mental strategies – use estimation when solving problems involving the addition, [subtraction, multiplication, and division of whole numbers, to help judge the reasonableness of a solution]	
Lesson 4: Solve Two-Step Problems, pp. 102–103	– solve problems involving the addition, subtraction, [and multiplication] of whole numbers, using a variety of mental strategies	
Mid-Chapter Review: p. 104		Assessment Opportunity
Math Game: Calculating Sums and Differences, p. 105		
Lesson 5: Communicate About a Choice of Calculation Method, pp. 106–107	– solve problems involving the addition, subtraction, [and multiplication] of whole numbers, using a variety of mental strategies – use estimation when solving problems involving the addition, subtraction, multiplication, and division of whole numbers, to help judge the reasonableness of a solution	
Lesson 6: Adding Decimals, pp. 108–109	• solve problems [involving the multiplication and division of multi-digit whole numbers, and] involving the addition [and subtraction] of decimal numbers to hundredths, using a variety of strategies – add [and subtract] decimal numbers to hundredths, including money amounts, using concrete materials, estimation, and algorithms	
Lesson 7: Adding Money, pp. 110–111	• solve problems [involving the multiplication and division of multi-digit whole numbers, and] involving the addition [and subtraction] of decimal numbers to hundredths, using a variety of strategies – add and subtract decimal numbers to hundredths, including money amounts, using concrete materials, estimation, and algorithms	
Lesson 8: Making Change, pp. 112–113	• solve problems [involving the multiplication and division of multi-digit whole numbers, and] involving the addition and subtraction of decimal numbers to hundredths, using a variety of strategies – add [and subtract] decimal numbers to hundredths, including money amounts, using concrete materials, estimation, and algorithms	
Lesson 9: Subtracting Decimals, pp. 114–116	• solve problems [involving the multiplication and division of multi-digit whole numbers, and] involving the [addition and] subtraction of decimal numbers to hundredths, using a variety of strategies – [add and] subtract decimal numbers to hundredths, including money amounts, using concrete materials, estimation, and algorithms	
Mental Math: Adding and Subtracting Close to Hundreds, p. 117		
Skills Bank: pp. 118–120		
Problem Bank: p. 121		
Chapter Review: pp. 122–123		Assessment Opportunity
Chapter Task: Counting Calories, p. 124	• solve problems [involving the multiplication and division of multi-digit whole numbers, and] involving the addition and subtraction of decimal numbers to hundredths, using a variety of strategies – solve problems involving the addition, subtraction, [and multiplication] of whole numbers, using a variety of mental strategies – add and subtract decimal numbers to hundredths, including money amounts, using concrete materials, estimation, and algorithms	Assessment Opportunity

Chapter 5 Planning Chart: Measuring Length and Time

Content	Expectations	Addressing Expectations
Getting Started: Skateboard Lengths, pp. 126–127 **Lesson 1:** Using Measurements to Describe Objects, pp. 128–129	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism] – select and justify the most appropriate standard unit (i.e., millimetre, centimetre, decimetre, metre, kilometre) to measure length, height, width, and distance, [and to measure the perimeter of various polygons]	Assessment Opportunity Use prompts A–G, questions 1–4 b).
Lesson 2: Measuring Lengths, pp. 130–131	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism]	
Math Game: Close as You Can, p. 132		Optional
Lesson 3: Measuring Circumference, p. 133		Beyond Grade 5 curriculum
Lesson A: Metric Relationships, Supplement, pp. 37–38	– solve problems requiring conversion from metres to centimetres and from kilometres to metres – estimate and measure the perimeter [and area] of regular [and irregular] polygons, using a variety of tools and strategies – select and justify the most appropriate standard unit (i.e., millimetre, centimetre, decimetre, metre, kilometre) to measure the side lengths and perimeters of various polygons	New Lesson
Lesson 4: Measuring Perimeter, pp. 134–135	• estimate, measure, and record perimeter, [area, temperature change, and elapsed time], using a variety of strategies – estimate and measure the perimeter [and area] of regular and irregular polygons, using a variety of tools and strategies – create, through investigation using a variety of tools and strategies, two-dimensional shapes with the same perimeter [or the same area]	***Teaching and Learning:*** Ask students why the centimetre is an appropriate unit to measure the perimeters of these shapes.
Mid-Chapter Review: p. 136		Assessment Opportunity Use Questions 1–2, 4–5.
Curious Math: Kilometre Study Guide, p. 137		
Lesson 5: Measuring the Perimeter of a Rectangle, pp. 138–140	• estimate, measure, and record perimeter, [area, temperature change, and elapsed time], using a variety of strategies – estimate and measure the perimeter [and area] of regular and irregular polygons, using a variety of tools and strategies – create, through investigation using a variety of tools and strategies, two-dimensional shapes with the same perimeter [or the same area] – determine, through investigation using a variety of tools and strategies, the relationships between the length and width of a rectangle [and its area] and perimeter, and generalize to develop the formulas – solve problems requiring the estimation and calculation of perimeters [and areas] of rectangles	***Teaching and Learning:*** Have students estimate perimeters before calculating, and have them share their estimation strategies.
Mental Imagery: Estimating Distances, p. 141		
Lesson 6: Solve Problems Using Tables, pp. 142–143	– demonstrate an understanding of simple multiplicative relationships involving unit rates, through investigation using concrete materials and drawings	

Content	Expectations	Addressing Expectations
Lesson 7: Measuring Time, pp. 144–145	• estimate, measure, and record [perimeter, area, temperature change, and] elapsed time, using a variety of strategies – estimate, measure (i.e., using an analogue clock), and represent time intervals to the nearest second – estimate and determine elapsed time, [with and] without using a time line, given the durations of events expressed in minutes, [hours, days, weeks, months, or years]	***Teaching and Learning:*** Extend the lesson to measurement of elapsed time in hours and minutes by asking students questions such as the following: "Yoshi brushed his teeth at 7:43 a.m. and again at 12:16 p.m. How much time passed between brushings?" (*about four and a half hours, or 4 hours 33 minutes*) "Khalid wanted to watch a movie that was on TV from 6:30 p.m. to 9:30 p.m. He missed the first 22 minutes of the movie. How many hours did he watch?" (*2 hours 34 minutes*) "A cross-country race began at 1:52 p.m. The winner crossed the finish line at 2:17 p.m. How long did she run?" (*25 minutes*)
Lesson B: Lengths of Time, Supplement, pp. 40–41	• estimate, [measure,] and record [perimeter, area, temperature change, and] elapsed time, using a variety of strategies – estimate and determine elapsed time, with and without using a time line, given the durations of events expressed in [minutes, hours,] days, weeks, months, or years	New Lesson
Lesson C: 24-hour Clocks, Supplement, pp. 43–44	• estimate, [measure,] and record [perimeter, area, temperature change, and] elapsed time, using a variety of strategies – solve problems involving the relationship between a 12-hour clock and a 24-hour clock – estimate and determine elapsed time, [with and] without using a time line, given the durations of events expressed in minutes, hours, [days, weeks, months, or years]	New Lesson
Lesson 8: Recording Dates and Times, pp. 146–147		Beyond Grade 5 curriculum
Skills Bank: pp. 148–149		Use Questions 1–5, 7–11.
Problem Bank: pp. 150–151		Use Questions 1–2, 5–8, 10–14. ***Consolidation:*** For Question 9, ask, "What is the perimeter of this shape in centimetres?"
Chapter Review: pp. 152–153		Assessment Opportunity Use Questions 1–2, 4–12.
Chapter Review: Supplement, p. 46		New Assessment Opportunity
Chapter Task: Perimeter Walk, p. 154	• estimate, measure, and record perimeter, [area,] temperature change, and elapsed time, using a variety of strategies • determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism] – estimate and determine elapsed time, with and without using a time line, given the durations of events expressed in minutes, hours, days, weeks, months, or years – estimate and measure the perimeter and area of regular and irregular polygons, using a variety of tools and strategies – solve problems requiring conversion from metres to centimetres and from kilometres to metres – solve problems requiring the estimation and calculation of perimeters [and areas] of rectangles	Assessment Opportunity

Chapter 6 Planning Chart: Multiplication and Division

Content	Expectations	Addressing Expectations
Getting Started: Making Dreamcatchers, pp. 155–156		Beyond Grade 4 curriculum
Getting Started: Making Dreamcatchers, Supplement, p. 48		New Getting Started
Lesson 1: Multiplying Tens, pp. 158–159	• solve problems involving the multiplication [and division] of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies – multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms	
Lesson 2: Estimating Products, pp. 160–161	• solve problems involving the multiplication [and division] of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies – multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms – use estimation when solving problems involving the [addition, subtraction,] multiplication, [and division] of whole numbers, to help judge the reasonableness of a solution	Use prompts A–B, Questions 1–4, 5 c)–f), 6.
Lesson 3: Solve Problems Using Tree Diagrams, pp. 162–163	• solve problems involving the multiplication [and division] of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies	Beyond Grade 5 curriculum
Lesson 4: Multiplying by Regrouping, pp. 164–165	• solve problems involving the multiplication [and division] of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies – multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms	
Lesson 5: Multiplying with Arrays, pp. 166–168	• solve problems involving the multiplication [and division] of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies – multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms – use estimation when solving problems involving the [addition, subtraction,] multiplication, [and division] of whole numbers, to help judge the reasonableness of a solution	
Curious Math: Array Multiplication, p. 169		Optional
Mid-Chapter Review: p. 170		Assessment Opportunity Use Questions 1–4, 5 c)–f), 6–7, 8 b)–f).
Lesson 6: Dividing Hundreds by One-Digit Numbers, p. 171	• solve problems involving the [multiplication and] division of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – divide three-digit whole numbers by one-digit whole numbers, using concrete materials, estimation, student-generated algorithms, and standard algorithms	Optional ***Teaching and Learning:*** Students learn that they can use division facts to divide hundreds, including hundreds that are four-digit numbers.
Lesson 7: Estimating Quotients, pp. 172–173		Beyond Grade 5 curriculum

Content	Expectations	Addressing Expectations
Lesson A: Estimating Quotients, Supplement, pp. 50–51	• solve problems involving the [multiplication and] division of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – divide three-digit whole numbers by one-digit whole numbers, using concrete materials, estimation, student-generated algorithms, and standard algorithms – use estimation when solving problems involving the [addition, subtraction, multiplication, and] division of whole numbers, to help judge the reasonableness of a solution	New Lesson
Lesson 8: Dividing Greater Numbers, pp. 174–176		Beyond Grade 5 curriculum
Lesson B: Dividing Three-Digit Numbers, Supplement, pp. 53–55	• solve problems involving the [multiplication and] division of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – divide three-digit whole numbers by one-digit whole numbers, using concrete materials, estimation, student-generated algorithms, and standard algorithms – use estimation when solving problems involving the [addition, subtraction, multiplication, and] division of whole numbers, to help judge the reasonableness of a solution	New Lesson
Math Game: Rolling Products, p. 177		Optional
Lesson 9: Choosing Multiplication and Division Methods, p. 178	• solve problems involving the multiplication and division of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies – multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms – divide three-digit whole numbers by one-digit whole numbers, using concrete materials, estimation, student-generated algorithms, and standard algorithms – use estimation when solving problems involving the [addition, subtraction,] multiplication, and division of whole numbers, [to help judge the reasonableness of a solution]	***Teaching and Learning:*** Multiplicands and dividends in this exploration may go beyond four digits, but are all multiples of 10.
Mental Math: Doubling to Multiply by 2, 4, and 8, p. 179		
Skills Bank: pp. 180–182		Use Questions 1–4, 6–11, 12 c)–d), 13–14.
Skills Bank: Supplement, p. 57		New Skills Bank
Problem Bank: p. 183		
Chapter Review: pp. 184–185		Assessment Opportunity Use Questions 1, 3–5.
Chapter Review: Supplement, p. 59		New Assessment Opportunity
Chapter Task: Raising Money, p. 186	• solve problems involving the multiplication and division of multi-digit whole numbers, [and involving the addition and subtraction of decimal numbers to hundredths,] using a variety of strategies – solve problems involving the [addition, subtraction, and] multiplication of whole numbers, using a variety of mental strategies – multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms – divide three-digit whole numbers by one-digit whole numbers, using concrete materials, estimation, student-generated algorithms, and standard algorithms – use estimation when solving problems involving the [addition, subtraction,] multiplication, and division of whole numbers, to help judge the reasonableness of a solution	Assessment Opportunity Replace Part 2 with the following: "Drake's Boy Scout troop wants to raise about $4000. How many more items do they have to sell to reach their goal? Explain how you know that each calculation is reasonable." Assign the Part 2 problem in the Student Book to any students who would enjoy an extra challenge.

Chapter 7 Planning Chart: 2-D Geometry

Content	Expectations	Addressing Expectations
Getting Started: Shape Hunt, pp. 188–189		Assessment opportunity Measuring angles with a protractor is beyond Grade 4 curriculum. In prompt B, students will identify equal angles simply by comparing them visually. For Question 2, have students use a square corner as a reference for right angles and describe the angles in the triangle in comparison to a right angle (e.g., a right angle, less than a right angle).
Lesson 1: Constructing Symmetrical Shapes, pp. 190–191		Optional. This lesson reviews concepts and skills from previous grades that might be useful in Lessons 6–8.
Lesson 2: Constructing Triangles, pp. 192–193		Beyond Grade 5 curriculum
Lesson A: Constructing Triangles, Supplement, pp. 61–62	– construct triangles, using a variety of tools, given acute or right angles and side measurements – measure and construct angles up to 90°, using a protractor	New Lesson
Lesson 3: Classifying Triangles by Angles, pp. 194–196	– identify and classify acute, right, obtuse, and straight angles – measure and construct angles up to 90°, using a protractor – identify triangles (i.e., acute, right, obtuse, [scalene, isosceles, equilateral)], and classify them according to angle and side properties	***Teaching and Learning:*** This lesson goes beyond Grade 5 curriculum to include measuring angles greater than 90°. Tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°." Tell students the definition of a straight angle (i.e., a 180° angle).
Curious Math: Diagonal Angles, p. 197		Tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°." Tell students to identify congruent obtuse angles visually.
Lesson 4: Classifying Triangles by Side Lengths, pp. 198–200	• identify and classify two-dimensional shapes by side and angle properties, [and compare and sort three-dimensional figures] – identify triangles (i.e., acute, right, obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties	***Teaching and Learning:*** Similar triangles are beyond Grade 5 curriculum. In prompt C, replace the word *similar* with *like*. For the Reflecting questions, tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°."
Mid-Chapter Review: p. 201		Assessment Opportunity Use Questions 1–2 a), 3 b)–4. For Question 3 a), tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°."
Lesson 5: Measuring Angles in Polygons, pp. 202–203	• identify and classify two-dimensional shapes by side and angle properties, [and compare and sort three-dimensional figures] – distinguish among polygons, regular polygons, and other two-dimensional shapes – measure [and construct] angles up to 90°, using a protractor	***Teaching and Learning:*** Introduce the lesson with the definition of polygon, and have students create examples of polygons and of shapes that are not polygons. Tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°."
Mental Imagery: Finding Shapes, p. 203		Optional
Lesson 6: Properties of Polygons, pp. 204–205	• identify and classify two-dimensional shapes by side and angle properties, [and compare and sort three-dimensional figures] – distinguish among polygons, regular polygons, and other two-dimensional shapes – measure [and construct] angles up to 90°, using a protractor – identify triangles (i.e., acute, right, obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties	***Teaching and Learning:*** Tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°."
Lesson 7: Sorting Polygons, pp. 206–207	• identify and classify two-dimensional shapes by side and angle properties, [and compare and sort three-dimensional figures] – distinguish among polygons, regular polygons, and other two-dimensional shapes – measure [and construct] angles up to 90°, using a protractor	

Content	Expectations	Addressing Expectations
Lesson 8: Communicate About Shapes, pp. 208–209	• identify and classify two-dimensional shapes by side and angle properties, [and compare and sort three-dimensional figures] – distinguish among polygons, regular polygons, and other two-dimensional shapes – identify and classify acute, right, obtuse, and straight angles – identify triangles (i.e., acute, right, obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties	***Teaching and Learning:*** Tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°."
Skills Bank: pp. 210–211		Optional: Select from Questions 1–2, 3 a)–b), 4, 6–8. For Question 5, students should sketch the triangles, rather than construct them.
Problem Bank: pp. 212–213		
Chapter Review: pp. 214–215		Assessment Opportunity Questions 1, 5 d), 6 are optional. For Question 2 a), change 100° to 90°. For Questions 3–4, tell students to use a protractor to identify but not to measure angles > 90°; they can record these angles as "> 90°."
Chapter Task: Design a Logo, p. 216	• identify and classify two-dimensional shapes by side and angle properties, [and compare and sort three-dimensional figures] – distinguish among polygons, regular polygons, and other two-dimensional shapes – identify and classify acute, right, obtuse, and straight angles – measure and construct angles up to 90°, using a protractor – identify triangles (i.e., acute, right, obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties – construct triangles, using a variety of tools, given acute or right angles and side measurements	Assessment Opportunity Students can draw obtuse angles by drawing angles greater than 90°; they do not have to measure obtuse angles. If you omitted Lesson 1, delete the requirement of one line of symmetry or make it optional.
Chapters 4–7 Cumulative Review: pp. 217–218		Assessment Opportunity Use Questions 1–3, 5–6, 7 b)–d), 8. For Question 4, change to 278 baseball cards; the answer is then A.

Chapter 8 Planning Chart: Area and Grids

Content	Expectations	Addressing Expectations
Getting Started: Measuring Area, pp. 220–221		Assessment Opportunity
Lesson 1: Areas of Polygons, pp. 222–223	• estimate, measure, and record [perimeter,] area, [temperature change, and elapsed time,] using a variety of strategies – estimate and measure the [perimeter and] area of regular and irregular polygons, using a variety of tools and strategies	***Teaching and Learning:*** Extend the lesson to include regular polygons. Have students estimate and measure the area in square units of an equilateral triangle, square, regular pentagon, regular hexagon, and regular octagon.
Lesson 2: Areas of Irregular 2-D Shapes, p. 224		Beyond Grade 5 curriculum
Curious Math: Pushing Corners, p. 225		Optional
Lesson 3: Relating Perimeter and Area of Rectangles, pp. 226–227	• estimate, measure, and record perimeter, area, [temperature change, and elapsed time,] using a variety of strategies • determine the relationships among units and measurable attributes, including the area of a rectangle [and the volume of a rectangular prism] – estimate and measure the perimeter and area of regular and irregular polygons, using a variety of tools and strategies – solve problems requiring the estimation and calculation of perimeters and areas of rectangles – create, through investigation using a variety of tools and strategies, two-dimensional shapes with [the same perimeter or] the same area	
Mental Imagery: Dividing Areas, p. 227		Optional
Lesson 4: Area Rule for Rectangles, pp. 228–229	• estimate, measure, and record [perimeter,] area, [temperature change, and elapsed time,] using a variety of strategies • determine the relationships among units and measurable attributes, including the area of a rectangle [and the volume of a rectangular prism] – estimate and measure the [perimeter and] area of regular and irregular polygons, using a variety of tools and strategies – create, through investigation using a variety of tools and strategies, two-dimensional shapes with [the same perimeter or] the same area – determine, through investigation using a variety of tools and strategies, the relationships between the length and width of a rectangle and its area and perimeter, and generalize to develop the formulas – solve problems requiring the estimation and calculation of perimeters and areas of rectangles	***Teaching and Learning:*** Have students brainstorm ways they can create 2-D shapes with the same area (e.g., create a congruent shape by tracing, cutting, and flipping; draw shapes on grid paper with the same areas (number of squares); cut a tracing of a shape into two or more pieces and then rearrange them so they attach with no overlaps; use pattern blocks to make a compound shape, then rearrange the same blocks into another shape, etc.). Provide students with any required materials and have them create some 2-D shapes with the same area.
Mid-Chapter Review: p. 230		Assessment Opportunity Use Questions 1, 3–4.
Curious Math: Stretching and Shrinking Rectangles, p. 231		Optional
Lesson 5: Solve Problems by Solving Simpler Problems, pp. 232–233	• estimate, measure, and record [perimeter,] area, [temperature change, and elapsed time,] using a variety of strategies • determine the relationships among units and measurable attributes, including the area of a rectangle [and the volume of a rectangular prism] – estimate and measure the [perimeter and] area of regular and irregular polygons, using a variety of tools and strategies – solve problems requiring the estimation and calculation of [perimeters and] areas of rectangles	
Lesson 6: Modelling Area, pp. 234–235	• estimate, measure, and record [perimeter,] area, [temperature change, and elapsed time,] using a variety of strategies • determine the relationships among units and measurable attributes, including the area of a rectangle [and the volume of a rectangular prism] – estimate and measure the [perimeter and] area of regular and irregular polygons, using a variety of tools and strategies – solve problems requiring the estimation and calculation of [perimeters and] areas of rectangles	Although not a Grade 5 math expectation, an examination of scale is included here because it is required in other areas of the curriculum.

Content	Expectations	Addressing Expectations
Lesson A: Locations on a Map, Supplement, pp. 64–65	• identify and describe the location of an object, using the cardinal directions, [and translate two-dimensional shapes] – locate an object using the cardinal directions (i.e., north, south, east, west) and a coordinate system – compare grid systems commonly used on maps (i.e., the use of numbers and letters to identify an area; the use of a coordinate system based on the cardinal directions to describe a specific location)	New Lesson
Lesson 7: Coordinate Grids, pp. 236–237		Beyond Grade 5 curriculum
Skills Bank: pp. 238–239		Use Questions 1, 2 b), 3–6, 8.
Problem Bank: pp. 240–241		Use Questions 1–7, 9.
Chapter Review: pp. 242–243		Assessment Opportunity Use Questions 1, 3–6.
Chapter Task: Model a Han Dynasty Home, p. 244	• estimate, measure, and record [perimeter,] area, [temperature change, and elapsed time,] using a variety of strategies – estimate and measure the [perimeter and] area of regular and irregular polygons, using a variety of tools and strategies – solve problems requiring the estimation and calculation of [perimeters and] areas of rectangles – locate an object using [the cardinal directions (i.e., north, south, east, west) and] a coordinate system	Assessment Opportunity

Chapter 9 Planning Chart: Multiplying Decimals (Omit Chapter)

Beyond Grade 5 curriculum

Chapter 10 Planning Chart: Dividing Decimals (Omit Chapter)

Beyond Grade 5 curriculum

Chapter 11 Planning Chart: 3-D Geometry and 3-D Measurement

Content	Expectations	Addressing Expectations
Getting Started: Building Shapes, pp. 300–301		Asssessment Opportunity
Lesson 1: Making 3-D Shapes, pp. 302–303		Beyond Grade 5 curriculum
Lesson 2: Making Nets, pp. 304–305	• identify and construct nets of prisms and pyramids – distinguish among prisms, right prisms, pyramids, and other three-dimensional figures – construct nets of prisms and pyramids, using a variety of tools	
Lesson 3: Identifying Nets, pp. 306–307	• identify and construct nets of prisms and pyramids – distinguish among prisms, [right prisms,] pyramids, and other three-dimensional figures – identify prisms and pyramids from their nets	
Lesson 4: Communicate About Building a Model, pp. 308–309		Beyond Grade 5 curriculum
Mid-Chapter Review: p. 310		Assessment Opportunity
Curious Math: Cross-Sections, p. 311		Optional
Lesson 5: Measuring and Comparing Capacity, pp. 312–313	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism]	
Mental Imagery: Counting Faces, Vertices, and Edges, p. 313		
Lesson 6: Measuring and Comparing Volume, p. 314–315		Beyond Grade 5 curriculum
Lesson 7: Relating Capacity Units to Volume, pp. 316–317	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism] – determine, through investigation, the relationship between capacity (i.e., the amount a container can hold) and volume (i.e., the amount of space taken up by an object), by comparing the volume of an object with the amount of liquid it can contain or displace	***Teaching and Learning:*** Remind students that capacity is the amount that a container will hold; volume is the amount of space occupied by an object. Introduce the term cubic centimetre (cm^3) (a unit of measurement for volume; the amount of space occupied by a cube with sides of 1 cm).
Lesson A: Volume of Rectangular Prisms, Supplement, pp. 67–68	– determine, through investigation using stacked congruent rectangular layers of concrete materials, the relationship between the height, the area of the base, and the volume of a rectangular prism, and generalize to develop the formula (i.e., *Volume = area of base × height)*	New Lesson
Lesson 8: Measuring and Comparing Mass, pp. 318–319	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism] – select and justify the most appropriate standard unit to measure mass (i.e., milligram, gram, kilogram, [tonne])	***Teaching and Learning:*** Extend the lesson to review measuring mass in milligrams. Remind students that 1000 mg = 1 g. Have students suggest items they could use as referents for 1 g (e.g., paper clip, raisin). Then ask them to select two or three items from the classroom whose mass they would measure in milligrams (e.g., a sheet of paper, a few pencil shavings) and explain why milligrams are an appropriate unit of measure for the item.
Lesson 9: Using Tonnes, pp. 320–321	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism] – select and justify the most appropriate standard unit to measure mass (i.e., [milligram], gram, kilogram, tonne)	***Teaching and Learning:*** Have students add their own mass in kilograms repeatedly to try to get to 1000 kg. This will give them a sense of the magnitude of 1 t. Then ask them to identify two or three items whose mass would likely be measured in tonnes (e.g., a ship, a large boulder) and explain why.
Lesson B: Choosing a Unit to Measure Mass, Supplement, p. 70	– select and justify the most appropriate standard unit to measure mass (i.e., milligram, gram, kilogram, tonne)	New Lesson
Skills Bank: pp. 322–323		
Problem Bank: pp. 324–325		

Content	Expectations	Addressing Expectations
Chapter Review: pp. 326–327		Assessment Opportunity
Chapter Task: Food Drive, p. 328	• determine the relationships among units and measurable attributes, [including the area of a rectangle and the volume of a rectangular prism] – select and justify the most appropriate standard unit to measure mass (i.e., milligram, gram, kilogram, tonne)	Assessment Opportunity
Chapters 8–11 Cumulative Review: pp. 329–330		Assessment Opportunity Use Questions 1, 6–8, 9 a)–c), 10 b).

Chapter 12 Planning Chart: Fractions

Content	Expectations	Addressing Expectations
Getting Started: Zoomobiles and Riders, pp. 332–333		Assessment Opportunity Use prompts A–G, Questions 1–4.
Lesson 1: Fraction Puzzles, pp. 334–335	• read, represent, compare, [and order whole numbers to 100 000, decimal numbers to hundredths,] proper [and improper] fractions, [and mixed numbers] – demonstrate and explain the concept of equivalent fractions, using concrete materials	
Mental Math: Multiply by Doubling, p. 335		
Lesson 2: Equivalent Fractions, pp. 336–337	• read, represent, [compare, and order whole numbers to 100 000, decimal numbers to hundredths,] proper [and improper] fractions, [and mixed numbers] – demonstrate and explain the concept of equivalent fractions, using concrete materials	
Lesson 3: Comparing Fractions, pp. 338–339		Beyond Grade 5 curriculum
Mid-Chapter Review: p. 340		Assessment Opportunity Use Questions 1–3.
Curious Math: Curious Fractions, p. 341		Beyond Grade 5 curriculum
Lesson 4: Improper Fractions and Mixed Numbers, pp. 342–343	• read, represent, [compare, and order whole numbers to 100 000, decimal numbers to hundredths, proper and] improper fractions, and mixed numbers – represent, [compare, and order] fractional amounts with like denominators, including proper and improper fractions and mixed numbers, using a variety of tools and using standard fractional notation	
Lesson A: Comparing and Ordering Fractions, Supplement, pp. 72–73	• read, represent, compare, and order [whole numbers to 100 000, decimal numbers to hundredths,] proper and improper fractions, and mixed numbers – represent, compare, and order fractional amounts with like denominators, including proper and improper fractions and mixed numbers, using a variety of tools and using standard fractional notation	New Lesson
Lesson 5: Relating Fractions to Decimals, pp. 344–345	– determine and explain, through investigation using concrete materials, drawings, and calculators, the relationship between fractions (i.e., with denominators of 2, 4, 5, 10, 20, 25, 50, and 100) and their equivalent decimal forms	
Lesson 6: Solve Problems by Making Models, pp. 346–347	• read, represent, compare, and order [whole numbers to 100 000, decimal numbers to hundredths,] proper and improper fractions, and mixed numbers – represent, compare, [and order] fractional amounts with like denominators, including proper and improper fractions and mixed numbers, using a variety of tools and using standard fractional notation – describe multiplicative relationships between quantities by using simple fractions and decimals	Optional
Lesson 7: Ordering Fractions on a Number Line, pp. 348–349		Beyond Grade 5 curriculum
Math Game: Target 1, p. 350		
Skills Bank: pp. 351–352		Use Questions 1–4, 7–11.
Problem Bank: pp. 353–354		
Chapter Review: p. 355		Assessment Opportunity Use Questions 1–7.
Chapter Task: Fractions in Your Life, p. 356	• read, represent, compare, and order [whole numbers to 100 000, decimal numbers to hundredths,] proper and improper fractions, and mixed numbers – represent, compare, and order fractional amounts with like denominators, including proper and improper fractions and mixed numbers, using a variety of tools and using standard fractional notation	Assessment Opportunity

Chapter 13 Planning Chart: Probability

Content	Expectations	Addressing Expectations
Getting Started: I Predict, pp. 358–359		Assessment Opportunity
Lesson 1: Using Probability Language, pp. 360–361	– represent, using a common fraction, the probability that an event will occur in simple games and probability experiments	
Mental Imagery: Creating Spinners, p. 361		
Lesson 2: Predicting Probabilities, pp. 362–363	• represent [as a fraction] the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models – represent, [using a common fraction,] the probability that an event will occur in simple games and probability experiments	
Lesson 3: Probabilities as Fractions, pp. 364–365	• represent as a fraction the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models – represent, using a common fraction, the probability that an event will occur in simple games and probability experiments	
Mid-Chapter Review: p. 366		Assessment Opportunity
Math Game: Sixty-Six, p. 367		
Lesson 4: Modelling Probability Problems, pp. 368–369	• represent as a fraction the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models – represent, using a common fraction, the probability that an event will occur in simple games and probability experiments – pose and solve simple probability problems, and solve them by conducting probability experiments and selecting appropriate methods of recording the results	***Teaching and Learning:*** Have students pose and solve their own probability problems.
Lesson 5: Using Tree Diagrams, pp. 370–371		Beyond Grade 5 curriculum Students could complete this lesson using organized lists to record the outcomes rather than using tree diagrams.
Lesson A: Using Organized Lists, Supplement, pp. 75–76	• represent as a fraction the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models – determine and represent all the possible outcomes in a simple probability experiment, using systematic lists and area models – represent, using a common fraction, the probability that an event will occur in simple games and probability experiments	New Lesson
Lesson B: Using Area Models, Supplement, pp. 78–79	• represent as a fraction the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models – determine and represent all the possible outcomes in a simple probability experiment, using systematic lists and area models – represent, using a common fraction, the probability that an event will occur in simple games and probability experiments	New Lesson
Lesson 6: Solve Problems by Considering All Possibilities, pp. 372–373		Beyond Grade 5 curriculum. Students could complete this lesson using organized lists to record the outcomes rather than using tree diagrams.
Curious Math: Birthday Math, p. 374		Use Questions 1–8.
Skills Bank: pp. 375–376		Use Questions 1–2.
Problem Bank: p. 377		
Chapter Review: pp. 378–379		Assessment Opportunity Use Questions 1 to 4, 8, 9. In Questions 8 and 9, have students record the possibilities using tree diagrams.
Chapter Task: Fair Games, p. 380	• represent as a fraction the probability that a specific outcome will occur in a simple probability experiment, using systematic lists and area models – determine and represent all the possible outcomes in a simple probability experiment, using systematic lists and area models – represent, using a common fraction, the probability that an event will occur in simple games and probability experiments – pose and solve simple probability problems, and solve them by conducting probability experiments and selecting appropriate methods of recording the results	Assessment Opportunity Have students use an organized list or area model to show all of the possible results of the dice rolls.

Chapter 14 Planning Chart: Patterns and Motion in Geometry

Content	Expectations	Addressing Expectations
Getting Started: Extending Transformation Patterns, pp. 382–383		Assessment opportunity Use prompts A–G, Questions 1–2, 4.
Lesson 1: Tiling an Area, p. 384		Beyond Grade 5 curriculum
Curious Math: Which Shapes Tile? p. 385		Beyond Grade 5 curriculum
Mental Imagery: Rotating Shapes, p. 385		Beyond Grade 5 curriculum
Lesson 2: Describing Tiling Patterns, pp. 386–387	• determine, through investigation using a table of values, relationships in [growing and shrinking] patterns, and investigate repeating patterns involving translations – create, identify, and extend numeric and geometric patterns, using a variety of tools – make predictions related to growing and shrinking geometric and numeric patterns – extend and create repeating patterns that result from translations, through investigation using a variety of tools – create and analyse designs by translating and/or reflecting a shape, or shapes, using a variety of tools	
Lesson 3: Extending Tiling Patterns, pp. 388–389		Beyond Grade 5 curriculum
Lesson 4: Translating Shapes on Grids, pp. 390–391	• [identify and describe the location of an object, using the cardinal directions, and] translate two-dimensional shapes – identify, perform, and describe translations, using a variety of tools	
Mid-Chapter Review: p. 392		Assessment Opportunity: Use Questions 2, 4.
Math Game: The Tiling Game, p. 393		
Lesson 5: Rotating Shapes, pp. 394–395		Beyond Grade 5 curriculum
Lesson 6: Communicate About Transformations, pp. 396–397		Beyond Grade 5 curriculum
Lesson 7: Modelling Congruence with Transformations, pp. 398–399	– create and analyse designs by translating and/or reflecting a shape, or shapes, using a variety of tools	***Teaching and Learning:*** Students can use a protractor for drawing acute and right angles but should use the transparent mirror or tracing paper to copy obtuse angles. Note also that students were introduced to rotations in previous grades and will consider them in depth in Grade 6; they are not a specific Grade 5 expectation.
Lesson 8: Exploring Similarity, p. 400		Beyond Grade 5 curriculum
Skills Bank: pp. 401–402		Use Questions 2–3.
Problem Bank: p. 403		Use Questions 1–2, 3 a), c), 4.
Chapter Review: pp. 404–405		Assessment Opportunity Use Questions 1– 4, 6.
Chapter Task: Tiling a Patio, p. 406		Beyond Grade 5 curriculum
Chapter Task: Frieze Patterns, Supplement, p. 81	• [determine, through investigation using a table of values, relationships in growing and shrinking patterns, and] investigate repeating patterns involving translations • [identify and describe the location of an object, using the cardinal directions, and] translate two-dimensional shapes – [identify,] perform, and describe translations, using a variety of tools – [extend and] create repeating patterns that result from translations, through investigation using a variety of tools – create and analyse designs by translating and/or reflecting a shape, or shapes, using a variety of tools	New Assessment Opportunity
Chapters 12–14 Cumulative Review: pp. 407–408		Assessment Opportunity Use Questions 1, 3–5, 7 b)–e), 8 a).

New Lessons

Teacher's Resource

Mathematics 5
Ontario Supplement

CHAPTER 1

A Building a Model

You will need

- toothpicks

- square tiles

Goal **Build a model to represent a number pattern.**

Juanita and Patrick built models to show a number pattern in a table.

Juanita used toothpicks and Patrick used square tiles.

Term number	Term
1	3
2	5
3	7
4	

? What will Juanita's and Patrick's models for the 5th term look like?

Juanita's Model

The 1st term in the pattern is 3.

I built a model using 3 toothpicks to represent term 1.

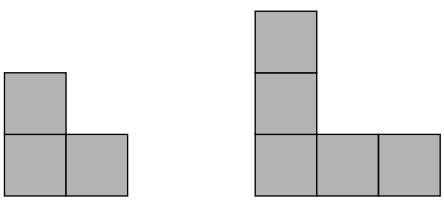
I used 2 more toothpicks to represent term 2.

shape 1 shape 2

Patrick's Model

I started with 3 tiles for the 1st term.

Then I added 2 tiles to build the 2nd term.



shape 1 shape 2

term

Each number or item in a pattern

term number

A number that tells the position of a term in a pattern

1, 3, 5, 7, ...

1st term **2nd term**

5 is the 3rd term, or term number 3.

A. Write the pattern rule for the number pattern.

B. Extend the table to show the 5th term.

C. Extend Juanita's model. What might the model for the 5th term look like?

D. What does the 5th shape in Patrick's model look like?

Reflecting

1. a) How does Juanita's model represent the number pattern?
b) How does Patrick's model represent the number pattern?

2. How would the models look different if the terms in the pattern were 3, 6, 9, … instead of 3, 5, 7, … ?

Checking

3. Noah made a shape pattern with toothpicks. The table shows the number of toothpicks he used.
a) Write the rule for the pattern.
b) How many toothpicks will be in the 5th shape?
c) Build a toothpick model to show the first 3 terms in the pattern.
d) How does your model show the pattern rule?

Shape number (term number)	Number of toothpicks (term)
1	4
2	7
3	10
4	

Practising

4. Alisa made a toothpick model of a pattern with this rule: Start at 2 and add 2 each time.
a) Make a table that shows the number pattern to the 4th term.
b) What do you think Alisa's model looked like? Build the first 4 shapes.

5. a) Model the first 3 terms in this pattern using tiles.
b) Kostas has 25 tiles. Does he have enough to model the 8th term in the pattern? Explain.

6. Build a model to represent this pattern: 9, 7, 5, … .

Shape number	Number of tiles
1	1
2	5
3	9
4	

A Building a Model

Guided Activity

Materials	• toothpicks, square tiles

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• build a model to represent a number pattern	• Students will use toothpicks or tiles to build a model that correctly represents a number pattern given in a table of values.	• Students may not be able to determine the number pattern from a table of values. Have students model the pattern with tiles. Ask them to determine the difference between one term and the next.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students the difference between growing and shrinking patterns. Discuss how patterns can be represented. Ask students whether they find it easier to determine a pattern rule using a model or a table.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Have students read about the models and patterns in Lesson 1A. Examine together the table and the highlighted definitions for *term* and *term number*. Discuss how the table shows a number pattern. Read the central question.

Read Juanita's Model and Patrick's Model and encourage students to make both models. Complete prompts A and B as a class, and then have students complete prompts C and D in pairs using toothpicks. Discuss their results.

Reflecting

Sample Discourse

1. a) • *The pattern starts with 3, and a triangle has 3 sides. Each new shape is made by adding 2 more toothpicks.*

b) • *Patrick's model starts with 3 tiles, and then each shape grows by 2 tiles.*

2. • *Each new shape would have to have 3 more toothpicks or tiles instead of 2, so the shapes would have to be different. E.g.,*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Provide toothpicks.

Practising (Individual)

4.–6. Provide toothpicks and square tiles.

5. Use Assessment Tool 8, Masters Booklet, p. 9, to assess answers for this key asssessment question.

Closing (Whole Class)

Have students build a model for the following pattern rule: Start at 4 and add 3 each time.

Answers

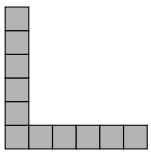
A. Start at 3 and add 2 each time.

B. For example,

Term number	Term
1	3
2	5
3	7
4	9
5	11

C.

D.

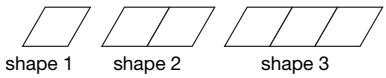


1. & 2. See sample answers under Reflecting.

3. a) Start at 4 and add 3 each time.

b) 16 toothpicks

c) For example,

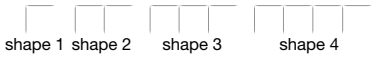


d) For example, the pattern starts with 4, and I made a shape with 4 sides. The pattern increases by 3 each time. Each new shape after the first one is made by adding 3 more toothpicks.

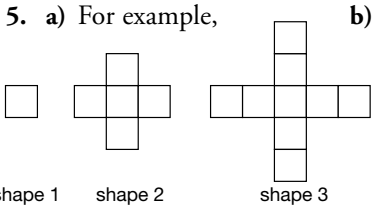
4. a)

Term number	Term
1	2
2	4
3	6
4	8

b) For example,



5. a) For example,



b) No; Kostas could build the 7th term, but not the 8th.

Shape number	Number of tiles
1	1
2	5
3	9
4	13
5	17
6	21
7	25
8	29

6. For example,

CHAPTER 1

B Variables in Expressions

You will need

- a calculator

Goal **Use an expression to describe a number pattern.**

Akiko and Teresa are reading novels. Akiko reads eight pages each day and Teresa reads six pages.

? How many pages will Akiko and Teresa each read in three weeks?

Akiko's Method

I'll use a table to see how many pages I'll read each day.

Number of days	Number of pages
1	8
2	16
3	24
4	

Teresa's Method

The number of pages I'll read in 1 day is 1×6.
The number of pages I'll read in 2 days is 2×6.
The number of pages I'll read in 3 days is 3×6.

The number of days is a **variable**. I'll use d to represent the variable. Now I can write an **expression** to show the number of pages read in any number of days.

The number of pages read in d days is $d \times 6$.

variable
A quantity that changes, or varies. A variable is often represented by a letter of the alphabet.

expression
A combination of variables, numbers, and symbols that represents a mathematical relationship.

$5 + n$ and $n \times 3$ are expressions.

A. Extend Akiko's table to calculate the number of pages she will read in one week.

B. How many pages will Akiko read in three weeks? Explain your strategy.

C. Replace *d* in Teresa's expression with the values 4, 5, 6, and 7. Calculate each product.

D. How many pages will Teresa read in one week?

E. How many pages will Teresa read in three weeks? Use the expression $d \times 6$.

Communication Tip

When you represent a variable with a letter, you might want to choose the first letter of the variable to help you remember what the letter stands for. For example, Teresa chose *d* to stand for "days."

Reflecting

1. How are Akiko's and Teresa's methods the same? How are they different?

Checking

2. Simon practises violin for 20 minutes each day.
- **a)** Write an expression to show the number of minutes he practises in any number of days.
- **b)** How many minutes does Simon practise in one week? Show your work.

Practising

3. Glynis is making beaded bracelets to sell. The expression $b \times 18$ represents the number of beads on any number of bracelets.
- **a)** How many beads will Glynis need to make 10 bracelets?
- **b)** If she uses 12 beads on each bracelet, how many will she need to make 10 bracelets?

4. Chi Chao is planning a party. He can spend up to $100 on an activity for his friends and himself.
- **a)** Laser tag costs $18 for each person. Write an expression to represent the cost for any number of people.
- **b)** Can Chi Chao invite 5 friends for laser tag? Show your work.

B Variables in Expressions

Guided Activity

Materials	• calculators

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• write an expression with a variable to describe a number pattern	• Students will write an expression using a variable to describe a number pattern, and then use addition, subtraction, multiplication, or division to determine the value of the expression.	• Some students may have difficulty writing expressions. Provide them with a pattern (e.g., Matteo drinks 4 glasses of water a day), some sample problems (e.g., how many glasses does he drink in 2 days? 7 days?), and an expression (e.g., $4 \times n$) and ask them which value changes and which value stays the same.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students how to find a missing term in an expression and how an expression can be used to describe a pattern rule.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Read about Akiko and Teresa in Lesson 1B. Read the central question and work through Akiko's Method and Teresa's Method together. Draw attention to the highlighted definitions for *variable* and *expression*. Read and discuss the Communication Tip, asking students what letter they would choose to represent a variable.

Complete prompts A to E as a class.

Reflecting Use these questions to ensure that students understand that multiplication is repeated addition, and that a variable represents the missing term in an expression.

Sample Discourse

1. • *They both find a pattern to solve the problem, but they show the pattern in different ways.*

- *In her table, Akiko adds another 8 for each day. This is like multiplying the number of pages by the number of days. But she has to fill out the whole table to get the answer for one week. Teresa can just say $d = 7$ and calculate 7×6.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

Encourage students to use mental math strategies. They may also use calculators.

Practising (Individual)

Students may use calculators.

4. Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this key asssessment question.

Closing (Whole Class)

Ask students to describe a pattern, then write an expression with a variable to represent the pattern.

Answers

A.

Number of days	Number of pages
1	8
2	16
3	24
4	32
5	40
6	48
7	56

B. 168 pages; for example, I multiplied the number of pages read in one week by 3; $56 \times 3 = 168$

C. $4 \times 6 = 24$, $5 \times 6 = 30$, $6 \times 6 = 36$, $7 \times 6 = 42$

D. 42 pages

E. $21 \times 6 = 126$ pages

1. See sample answers under Reflecting.

2. **a)** For example, $d \times 20$

b) 140 minutes; for example, $7 \times 20 = 140$

3. **a)** 180 beads

b) 120 beads

4. **a)** For example, $n \times \$18$

b) Yes; $5 \times \$18 = \$90$

C Solving Equations

Goal **Determine the missing number in an equation.**

Liam and Karin have started a company called LK comics. Liam writes the stories and Karin draws the pictures.

They sell photocopies of the comics at their school.

They made 40 copies of their first comic, *Lemony-Lime*. Each of them took 20 copies to sell. After the first day, Liam has 12 copies left and Karin has 9 copies left.

? How many copies of their first comic have Liam and Karin sold?

Liam's Equations

We each started with 20 copies. I have 12 left and Karin has 9 left.

I can write equations with missing numbers to represent this situation.

I'll use a variable to show the missing number.

$20 = 12 + m$ and $20 = 9 + k$

$20 = 12 + 8$, so I sold 8 copies.

$20 = 9 + 11$, so Karin sold 11 copies.

Together, we've sold $11 + 8 = 19$ copies.

Reflecting

1. How do you think Liam determined the missing numbers in his equations?
2. Monique says Liam could have used the equation $20 - 12 = m$ to determine the number of copies he sold. Do you agree? Explain your answer.

Checking

3. Karin and Liam made 60 copies of their next comic, *Kaboom*. Liam took 40 to sell and sold 25. Karin took the rest and sold 14.
   a) What does m stand for in the equation $40 = 25 + m$?
   b) What does k stand for in the equation $20 = 14 + k$?
   c) How many copies of *Kaboom* does Liam have left to sell?
   d) How many copies of *Kaboom* does Karin have left to sell?

Practising

4. Determine the missing number in each equation.
   a) $n + 5 = 10$ **c)** $50 + p = 75$ **e)** $64 \div t = 8$
   b) $12 - m = 6$ **d)** $6 \times r = 30$ **f)** $s \times 9 = 72$

5. It takes 24 sheets of paper to make 2 copies of *Lemony-Lime* or 3 copies of *Kaboom*.
   a) What does p represent in the equation $24 = 2 \times p$?
   b) What does q represent in the equation $3 = 24 \div q$?
   c) How many sheets of paper are needed for each copy of *Lemony-Lime*?
   d) How many sheets of paper are needed for each copy of *Kaboom*?

6. Determine the missing number in each equation.
   a) $19 = r + 2$ **b)** $17 = 37 - n$ **c)** $18 = 3 \times t$

7. Karin and Liam made 50 copies of another comic book and sold 35 copies. They collected $70. Each copy cost $1 for paper and printing.
   a) Write an equation to represent how much they charged for each copy.
   b) How much altogether did they spend on paper and printing?
   c) Write an equation to represent the profit they made.

C Solving Equations

Direct Instruction

Materials	• (optional) counters, calculators
Masters	• (optional) Base Ten Blocks: Ones, Tens, Hundreds, Masters Booklet pp. 38–40, Number Lines, Masters Booklet p. 37

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• determine the variable in an equation	• Students will use a variety of tools and strategies to determine the missing number in equations involving addition, subtraction, multiplication, or division.	• Some students may have difficulty understanding what 20 = 9 + *k* means. Encourage them to read the expression out loud in various ways, (e.g., "20 copies is equal to 9 copies left plus some number of copies sold" or "9 plus a number is 20"). Students may use counting up or fact families to determine the missing number. Allow them to use base ten blocks, counters, or number lines to model expressions.

1. Introduction (Whole Class) ▸ 5–10 min

Review the terms *variable* and *expression* by providing a pattern (e.g., add 5 each time) and asking students to write an expression with a variable to represent the pattern. Review also the term *equation* (a number sentence with an equal sign to show that the left side is equal to the right side). Show some examples (e.g., 4 + 2 = 6 and 4 = 6 – 2). Review fact families by pointing out to students that your examples are from the same fact family.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Ask students to turn to Lesson 1C. Together, read about Liam and Karin's comic-making venture and the central question. Work through Liam's Equations. Draw attention to the letters Liam chose for variables (*m* and *k*) and ask students to suggest why he chose those letters.

Reflecting Use these questions to ensure that students understand how to solve for a missing variable.

Sample Discourse

1. • *I think he added on to 12 to get 20. He might have said, 12 + 3 = 15 and 5 more make 20.*

• *I think he used related fact families: 20 = 12 + g is from the same family as 20 – 12 = g, so then he could just subtract to get the answer.*

2. • *Yes, because this equation will tell him the difference between the number of comics he started with and the number left. The difference between those numbers is how many he sold.*

• *Yes, because 20 – 12 = m and 20 = 12 + m are in the same fact family, so I will have the same value in both equations.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Students may use counters to model the expressions.

Practising (Individual)

4. Use Assessment Tool 8, Masters Booklet, p. 9, to assess answers for this key asssessment question.

5. & 7. Students may use counters to model the expressions. Have students share the strategies they used to complete the questions.

Closing (Whole Class)

Ask students to show their work as they solve the following equation:

45 = 10 + *r*

Answers

1. & 2. See sample answers under Reflecting.

3. **a)** The number of copies of *Kaboom* Liam has left to sell

b) The number of copies of *Kaboom* Karin has left to sell

c) 15 comics

d) 6 comics

4. **a)** 5 **b)** 6 **c)** 25 **d)** 5 **e)** 8 **f)** 8

5. **a)** The number of sheets of paper needed to make each copy of *Lemony-Lime*

b) The number of sheets of paper needed to make each copy of *Kaboom*

c) 12 sheets of paper

d) 8 sheets of paper

6. **a)** 17 **b)** 20 **c)** 6

7. **a)** For example, 70 = 35 × *p*

b) $50

c) For example, 70 – 50 = *r*

LESSON

Chapter Review

A

1. Marcus made a shape pattern with toothpicks. The table shows the number of toothpicks he used.

Shape number (term number)	Number of toothpicks (term)
1	5
2	9
3	13
4	

a) Write the rule for the pattern.
b) How many toothpicks did Marcus use for the 5th shape?
c) Build a toothpick model to represent the first 4 terms in the pattern.
d) How does your model show the pattern rule?

B

2. Camille plans to read 25 pages each week.
a) Write an expression to represent the number of pages Camille will read in any number of weeks.
b) Use your expression to determine the number of pages she will read in 17 weeks.

3. Teresa practises guitar for 30 minutes each day of the week except Saturday.
a) Write an expression to represent the number of minutes she practises in any number of days.
b) How many minutes will she practise in one week? Show your work.

C

4. Determine the missing number in each equation.
a) $n + 2 = 7$
b) $8 - m = 6$
c) $20 + s = 35$
d) $15 = 3 \times t$
e) $2 = 12 \div w$
f) $q \times 7 = 21$

5. Jose received $50 for his birthday.
He spent $27 on CDs and a book.
The book cost $9.
a) What does b represent in the equation $50 = 27 + b$?
b) What does c represent in the equation $27 = 9 + c$?
c) How much of Jose's birthday money is left?
d) How much did Jose spend on CDs?

Chapter Review Lessons A, B, and C

Using the Chapter Review

Materials	• toothpicks

Use this supplemental review to assess students' understanding of the concepts developed in Lessons 1A, 1B, and 1C. All questions can be used for summative assessment.

Related Questions to Ask

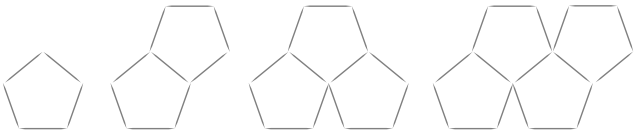
Ask	Possible Response
About **Question 3**: • How many hours will Teresa practise in one month? Show your work.	• *6 days × 4 week each month = 24 days, 24 days × 30 minutes each day, 720 minutes ÷ 60 minutes each hour = 12 hours*

Answers

1. a) Start at 5 and add 4 each time.

b) 21 toothpicks

c) For example,



d) For example, the pattern starts with 5, and I made a pentagon, which has 5 sides. The pattern increases by 4 each time. Each pentagon after the first one is made by adding 4 more toothpicks.

2. a) For example, $w \times 25$

b) $17 \times 25 = 425$

3. a) For example, $d \times 30$

b) 180 minutes; $\overline{)6}$ days × 30 minutes each day = 180 minutes

4. a) 5

b) 2

c) 15

d) 5

e) 6

f) 3

5. a) The amount of money Jose has left

b) The amount of money Jose spent on CDs

c) $23

d) $18

CHAPTER 3

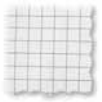
A Collecting Data

You will need

- a thermometer
- tap water

- a cup or mug

- grid paper



- a ruler

Goal **Determine, represent, and describe temperature changes over time.**

? How does the temperature of hot water change over 10 minutes at room temperature?

A. Predict how much the temperature of hot water will change over 10 minutes at room temperature.

B. Measure the temperature in the room.

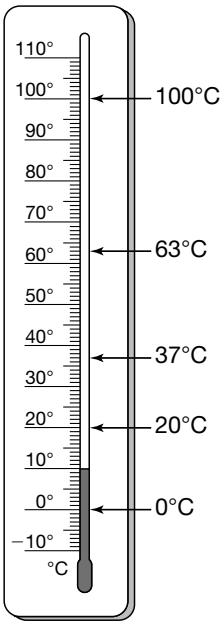
C. Fill a cup with hot water. Estimate and then measure the temperature of the water.

D. Measure the water temperature every 2 minutes for 10 minutes. Record your data in a t-chart.

Time (minutes)	Temperature (°C)
Start	

E. Make a broken-line graph of your data.

F. What does the graph show about how the temperature changed?



G. Describe the experiment and your results.
- How did you collect the data?
- How much did the temperature change in 10 minutes?
- How accurate was your prediction?

Reflecting

1. How did you decide what temperature to record when the line in the thermometer was between degree marks?

2. Jo measured only at the start and at 10 minutes. What could you see from your data that she couldn't see from hers? Explain.

A Collecting Data

Exploration

Materials	• thermometers, tap water, cups or mugs, rulers
Masters	• 1 cm Grid Paper, Masters Booklet p. 28

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• measure, record, and describe temperature changes over time	• Students will accurately measure and record temperature data, determine changes between readings, and describe the changes using a broken-line graph.	• Some students may have difficulty graphing the data. Review with them how to create a broken-line graph.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students the degree Celsius symbol (°C) and how to read a thermometer. Go over some benchmark temperatures, such as the boiling temperature of water (100°C), the freezing temperature of water (0°C), and average normal body temperature (37°C).

2. Teaching and Learning (Whole Class/Pairs) ▸ 35–40 min

Ask students to turn to Lesson 3A. Together read the central question. Read prompts A to D as a class to make sure students understand how to conduct the experiment. Highlight that they are asked to record and describe the temperature every 2 minutes.

Students can work in pairs to collect their data by completing prompts A to D. The water they use should be hot, but not boiling. Then pairs can work together to organize and interpret the data by completing prompts E to G. You may want to discuss variables that may have affected their results (starting water temperature, room temperature, whether the thermometer was working properly) and how they could control those variables.

Reflecting Use these questions to ensure that students understand how to measure temperature and the concept of temperature change over time.

Sample Discourse

1. • *I decided which degree it looked closest to and recorded that.*

2. • *I could see whether the water cooled faster at the beginning or end of the 10 minutes.*

3. Consolidation ▸ 5–10 min

Closing (Whole Class)
Ask students to explain how their graph shows that the water cooled faster at the beginning of the 10-minute period than at the end.

Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this whole exploration.

Answers

A. For example, about 10°C

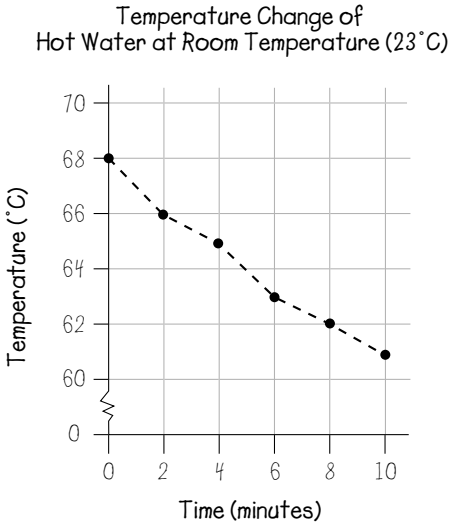
B. For example, 23°C

C. For example, about 75°C; 68°C; My estimate was high.

D. For example,

Time (minutes)	Temperature (°C)
Start	68
2	66
4	65
6	63
8	62
10	61

E. For example,



F. For example, the temperature dropped quickly at first and then more slowly.

G. For example, we collected the data by measuring the temperature every 2 minutes. The temperature dropped 7°C in 10 minutes. I predicted it would drop almost twice as much.

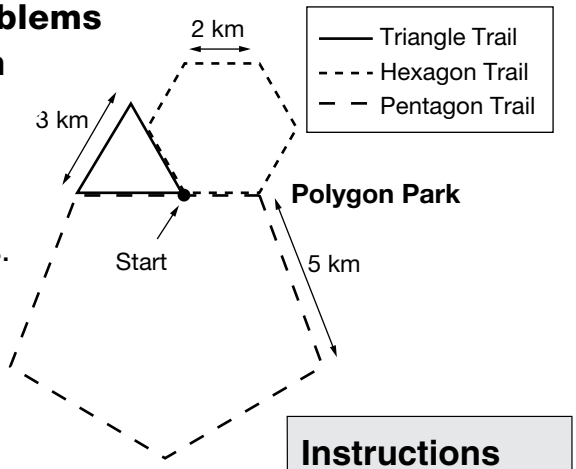
1. & 2. See sample answers under Reflecting.

CHAPTER 5

A Metric Relationships

Goal **Solve length and perimeter problems by expressing measurements in different units.**

Patrick is marking some new hiking trails at Polygon Park by tying ribbons to tree branches.



? How can Patrick determine and describe the length of ribbon needed to mark Triangle Trail?

Instructions
Tie 1 ribbon every 10 m. Each ribbon should be 1 m long.

Patrick's Solution

Step 1

The length of the trail is the perimeter of the triangle.
The shapes are all **regular polygons**, so the sides of the triangle are all the same length.
The trail is 3 km + 3 km + 3 km = 9 km long.

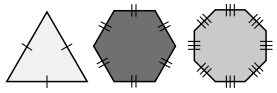
Step 2

I need to figure out how many ribbons I need.
I'll tie one ribbon every 10 m, so I'll find out the length of the trail in metres. Then I'll divide the length by 10 m.
1 km = 1000 m.
So 9 km is 9 × 1000 m = 9000 m
9000 m ÷ 10 m = 900. I need 900 ribbons.

Step 3

Each ribbon is 1 m long, so I need 900 m of ribbon.
900 m is close to 1000 m. That's almost 1 km of ribbon.
1 m = 100 cm
So 900 m is 900 × 100 cm = 90 000 cm of ribbon.

regular polygon
A closed, straight-sided 2-D shape with equal sides



Reflecting

1. In step 3, Patrick expressed the length of ribbon in metres, kilometres, and centimetres. Which unit do you think is most appropriate? Why?
2. How did Patrick calculate the length of Triangle Trail in metres?

Checking

3. **a)** How many metres of ribbon does Patrick need to mark Hexagon Trail? Show your work.
   b) How many centimetres of ribbon does Patrick need to mark Hexagon Trail?

Practising

4. Complete the measurements.
   a) 17 km = ■ m
   b) 386 m = ■ cm
   c) 9.4 km = ■ m
   d) 18.25 m = ■ cm
   e) 0.7 km = ■ m
   f) 0.25 km = ■ cm

5. Patrick walked all the way around all three trails. How many metres did he walk? Show your work.

6. What unit would you use to measure each? Explain.
   a) the perimeter of a leaf
   b) the width of a trail
   c) the height of a tree
   d) the perimeter of a forest

7. Matthew is training for a half marathon run. In his next race, he'll run 10 km. Then he'll run 21 km in the half marathon. The longest race he has run so far is 5000 m.
   a) How much longer is 10 km than 5000 m? Show your work.
   b) How much longer is the half marathon than 5000 m?

A Metric Relationships

Direct Instruction

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• express kilometre measurements in metres and metre measurements in centimetres	• Students will correctly express one metric unit as another to solve problems.	• Some students may not understand the need to change units so that the measurements of two objects are expressed using the same unit. Show them a similar problem using money (e.g., How many dimes would 4 quarters make?) to demonstrate that to compare two amounts of money, they must be expressed using the same unit.

1. Introduction (Pairs/Whole Class) ▸ 5–10 min

Have students work in pairs to measure their height in both centimetres and metres. Ask students which measurement is longer. Make sure they understand that different units can be used to express the same length.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Together read about the hiking trails in Polygon Park in Lesson 5A and examine the diagram. Read the central question and work through Patrick's Solution together. Draw attention to the highlighted definition for *regular polygon*. You may want to review multiplying whole numbers and decimals by 10, 100, and 1000.

Reflecting Use these questions to ensure that students understand the relationships among units of length and selecting an appropriate unit for the situation.

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Remind students that one ribbon measures 1 m.

Practising (Individual)

4. Post the following as a reference for students:
- 1 m = 100 cm
- 1 km = 1000 m

5. Use Assessment Tool 8, Masters Booklet, p. 9, to assess answers for this key assessment question.

Closing (Whole Class)

Ask students if they prefer to record their height in centimetres or metres and to explain why. Ask if they prefer to measure the distance between their house and the school in centimetres, metres, or kilometres, and to explain why.

Answers

1. For example, I think metres is appropriate, because that's how the ribbon is measured.

2. Patrick multiplied 9 km by 1000 to get 9000 m.

3. **a)** 1200 m of ribbon; for example, perimeter of hexagon is 2 km × 6 = 12 km; 12 km = 12 000 m; 12 000 m ÷ 10 m = 1200 ribbons needed, so 1200 m of ribbon is needed

b) 120 000 cm

4. **a)** 17 000 m

b) 38 600 cm

c) 9400 m

d) 1825 cm

e) 700 m

f) 25 000 cm

5. 46 km; for example, perimeter of pentagon is 5 km × 5 = 25 km; total perimeter of three trails is 25 km + 9 km + 12 km = 46 km

6. **a)** centimetres; for example, because usually it will be at least a centimetre and much less than a metre

b) metres; for example, because a trail would usually need to be at least a metre wide to allow room for people to walk along it, and you wouldn't need a precise measurement that centimetres would provide since the width of the trail would vary

c) metres; for example, grown trees are usually at least a few metres tall

d) kilometres; for example, forests are large and would have perimeters of at least a few kilometres

7. **a)** 5000 m; for example, 10 km = 10 000 m, 10 000 m – 5000 m = 5000 m

b) 16 000 m

CHAPTER 5

B Lengths of Time

You will need

- a calendar for a year

Goal **Estimate and determine lengths of time in days, weeks, months, or years.**

A new movie that stars Martin and Jose's favourite actor is opening soon. Martin plans to see it the day it opens. Jose says he'll wait for the DVD.

? How long do Martin and Jose each have to wait to see the movie?

Martin's Strategy

Today is November 15. A month from now is December 15, so the movie opens in about 3 weeks.

I'll draw a time line to be more exact.

Jose's Strategy

I'll count the months from November 15, keeping track as I count:

Dec. 15, Jan. 15, Feb. 15, March 15, April 15

/ / / / /

That's 5 months.

May 11 is close to May 15, so it's almost 6 months until the DVD comes out.

I'll use a calendar to count the exact number of weeks and days from April 15 to May 11.

A. Complete Martin's calculation. How many weeks and days does he have to wait to see the movie?

B. Explain how Jose counted the months.

C. Complete Jose's calculation. How long does he have to wait in months, weeks, and days?

Reflecting

1. Why do you think Martin estimated the time in weeks and Jose estimated the time in months?

2. How is using a time line to determine lengths of time like using a calendar? How is it different?

Checking

3. Monique says she will wait to see the movie on pay-per-view.
- **a)** Estimate how long Monique will wait to see the movie.
- **b)** How much longer will Monique wait than Jose? Write the length of time in months, weeks, and days.

Practising

4. Determine the dates.
- **a)** 10 months and 2 weeks after July 23
- **b)** 12 weeks after September 6
- **c)** 27 days after February 6, in a leap year
- **d)** 75 years after 1930

5. The movie Martin and Jose want to see was based on a book published in 1942. How long after the book was published was the film released?

6. The movie was shot from January 26 to March 7 in the year it was released.
- **a)** How long did the shooting of the film last? Estimate, then determine the length of time in months, weeks, and days.
- **b)** How long after shooting of the film ended was the film released? Estimate, then determine the length of time in months, weeks, and days.

B Lengths of Time

Guided Activity

Materials	• calendar, (optional) desk calendar, wall calendar

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• estimate and determine lengths of time in days, weeks, months, and years	• Students will use a time line or a calendar to determine lengths of time in days, weeks, months, and years.	• Some students may be confused when using a calendar as they flip from month to month. Encourage them to use a wall calendar that shows an entire year or have them draw a time line.

1. Introduction (Whole Class) ▸ 5–10 min

Ask students how often they use a calendar and for what purpose. Brainstorm a list of different types of calendars, such as a desk calendar, a monthly calendar, or a wall calendar that displays the year from January to December or from September to August. Have examples available for students to look at, and discuss the differences. Demonstrate to students how to count the weeks from any date on a calendar, then ask for several volunteers to show the date any number of weeks (e.g., 1, 4, 8) from the current date.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to turn to Lesson 5B. Together read about the movie that Martin and Jose want to see and read the central question. Discuss the problem and then work through Martin's Strategy and Jose's Strategy together. Students can complete prompts A through C in pairs. Discuss their responses to the prompts, noting the differences between the two strategies used by Martin and Jose.

Reflecting Use these questions to ensure that students can determine the length of time in months and weeks to a future date. Ensure also that students understand why one would use months to express one amount of time and weeks to express another amount of time.

Sample Discourse

1. • *If Martin estimated in months, his estimate would not be as close. It would be hard for Jose to estimate precisely in weeks, as the DVD release is several months away, so months make sense for his estimate.*

• *The longer the time period, the less precise an estimate needs to be.*

2. • *With both the calendar and the time line, you count months, weeks, and days, but a calendar is organized in rows and columns instead of along a line.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Encourage students to use a calendar or draw a time line.

Practising (Individual)

4. Use Assessment Tool 8, Masters Booklet, p. 9, to assess answers for this key assessment question.

4. & 6. Encourage students to use a calendar. If students are having difficulties, have them work in pairs.

Closing (Whole Class)

Ask students to explain in step-by-step format how to determine the length of time to their next birthday.

Answers

A. 3 weeks and 3 days

B. For example, Jose started with the current date (November 15) and counted forward one month to the same date in December (December 15), then one month to the same date in January, and so on, until he got as close as he could to the final date (May 11) without passing it. He kept a tally as he counted the months until April 15, then he started counting the weeks and days.

C. 5 months, 3 weeks, and 5 days

1. & 2. See sample answers under Reflecting.

3. a) For example, about 9 months

b) 2 months, 3 weeks, and 3 days

4. a) June 6

b) November 29

c) March 4

d) 2005

5. 64 years (in 2006)

6. a) For example, about 5 weeks; 1 month, 1 week, and 2 days

b) About 9 months; 9 months, 2 days

CHAPTER 5

C 24-hour Clocks

Goal **Relate times on clocks and determine lengths of time.**

When Sofia goes to bed one night, she has 11 **h** and 30 **min** to wait until she begins a trip to visit her grandmother. Her train ticket shows she will leave Toronto at 09:00 and arrive in Sudbury Junction at 15:57.

? What time should Sofia's watch show when her train arrives in Sudbury Junction?

Sofia's Times

My watch uses a 12 h clock. I know that train schedules use a **24 h clock.**

On a 24 h clock, midnight is 00:00.

Times are written by counting the hours from midnight.

So 1:00 a.m. is 01:00, noon is 12:00, 1:00 p.m. is 13:00, and 4:25 p.m. is 16:25.

h
The symbol for hours

min
The symbol for minutes

24 h clock
A method of telling time from 00:00 to 23:59

A. Write the time 09:00 using a.m. or p.m.

B. Sofia bought a snack at 11:45 a.m. Write this time for a 24 h clock.

C. She bought another snack 2 h later. Write this time using a.m. or p.m. and for a 24 h clock.

D. What time should Sofia's watch show when her train arrives in Sudbury Junction?

Reflecting

1. You wrote a time two ways in Part C. How are the ways different? How are they the same?

2. How can you write 24 h clock times using a.m. or p.m.?

Checking

3. Sofia's next train leaves Sudbury Junction at 15:58, and arrives in Sioux Lookout at 09:05.
- **a)** Write each time using a.m. or p.m.
- **b)** How long did her trip take?

Practising

4. Write each arrival time using a.m. or p.m.
a) 18:10 **b)** 11:50 **c)** 22:45

5. Write the time now using a.m. or p.m. and for a 24 h clock.

6. At what time did Sofia go to bed the night before her trip? Remember it was 11 h and 30 min before 09:00. Write the time for a 24 h clock. Show your work.

7. Celeste travelled by train from Washago to Guelph, changing trains in Toronto.
- **a)** Estimate how long she spent travelling.
- **b)** How long was her trip from start to finish?
- **c)** How much time did she spend on the train?

Trip	Depart	Arrive
Cornwall to Toronto	16:46	20:13
Ottawa to Kingston	12:30	14:32
Windsor to London	17:30	19:11

Trip	Depart	Arrive
Washago to Toronto	17:49	20:00
Toronto to Guelph	22:15	23:28

C 24-hour Clocks

Guided Activity

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• record and read times in 24 h notation	• Students will accurately read and write times using 24 h notation and determine lengths of time.	• Some students may have difficulty writing times. Provide number lines and have them record hourly times from 12 midnight to 12 midnight with a.m. or p.m. and with 24 h notation on the same time line to use as a reference.

1. Introduction

(Pairs/Whole Class) ▸ 5–10 min

Direct attention to the numbers on the classroom clock. Ask how high the numbers for hours go. If it is a 12 h clock, ask students if they have ever seen a clock with numbers for the hours past 12. If it is a 24 h clock, ask students to explain the numbers for the hours past 12.

2. Teaching and Learning

(Whole Class) ▸ 20–25 min

Have students turn to Lesson 5C. Read about Sofia's train trip to visit her grandmother. If possible, help students find Toronto and Sudbury Junction on a map. Explain that the times are written for a 24 h clock. Discuss the highlighted definitions for *h*, *min*, and *24 h clock*. Relate the number of hours for a 24 h clock to the daily cycle of 24 h in a day. Have students count the hours from midnight to 09:00 on the picture.

Read the central question. Then work though Sofia's Times together, having students point out the times on an analog clock. As a class, complete prompts A to D.

Reflecting Use these questions to ensure that students understand that the times with a.m. or p.m. and times for a 24 h clock are different ways to name the same time.

Sample Discourse

1. • *One shows the time as one forty-five and one shows it as thirteen forty-five.*
- *One uses a.m. and p.m. and the other doesn't.*
- *Both show 45 minutes past the hour.*

2. • *If the time is less than 12:00 hours, you just write a.m. after it.*
- *If the number of hours is more than 12, that means it's p.m., and you just subtract 12 hours from the time to get the number of hours for a 12 h clock.*

3. Consolidation ▸ 20-25 min

Checking (Pairs)

3. Students may find it helpful to refer to an analog clock.

Practising (Individual)

5. Students can repeat this question for various times throughout the day.

7. Students may find it helpful to refer to an analog clock.

Use Assessment Tool 6, Masters Booklet, p. 7, to assess answers for this key assessment question.

Closing (Whole Class)

Ask students to state the length of time until they go home for the day and to express that time using 24 h notation.

Answers

A. For example, 9:00 a.m.

B. 11:45

C. 1:45 p.m.; 13:45

D. 3:57 p.m.

1. & 2. See sample answers under Reflecting.

3. **a)** 3:58 p.m., 9:05 a.m.
b) 17 h 7 min

4. **a)** 6:10 p.m.
b) 11:50 a.m.
c) 10:45 p.m.

5. For example, 11:02 a.m., 11:02

6. 21:30; for example, she went to bed 11 h and 30 min before 09:00, which is 9:00 a.m. 12 h before 9:00 a.m. is 9:00 p.m., so she went to bed half an hour after that, at 9:30 p.m. On a 24 h clock, 9:30 p.m. is 21:30.

7. **a)** For example, about 5 h
b) 5 h 39 min
c) 3 h 24 min

Chapter Review

LESSON

A

1. Complete the measurements.

a) 13 km = ■ m
b) 142 m = ■ cm
c) 3.6 km = ■ m
d) 9.55 m = ■ cm
e) 0.35 km = ■ m
f) 0.4 km = ■ cm

2. Heather is stencilling a border along a wall of her room. She paints a copy of the design every 25 cm. The length of the wall is 5 m. How many copies of the design will she need to paint? Show your work.

B

3. How many months, weeks, and days is it from today until the first day of the summer vacation?

4. Write down your date of birth. Then describe your age in years, months, weeks, and days.

C

5. Write each time using a.m. or p.m.

a) 17:30
b) 10:40
c) 21:25

6. Dan missed the 18:03 train from Brockville to Kingston. The next train left at 19:35.

a) About how long did he have to wait?
b) How long did he wait in hours and minutes?

7. Juanita travelled by train from Niagara Falls to Smiths Falls, changing trains in Toronto.

a) Estimate how long she spent travelling.
b) How long was her trip from start to finish?
c) How long was the wait between trains?

Trip	Depart	Arrive
Niagara Falls to Toronto	14:10	15:58
Toronto to Smiths Falls	18:34	22:33

Chapter Review Lessons A, B, and C

Using the Chapter Review

Use this supplemental review to assess students' understanding of the concepts developed in Lessons 5A, 5B, and 5C. All questions can be used for summative assessment.

Related Questions to Ask

Ask	Possible Response
About **Question 2**: • How many copies of the design would Heather need for 1 m of the wall? 2 m?	• *4 copies, 1 m = 100 cm, 100 cm ÷ 25 cm = 4; 8 copies, 2 m = 200 cm, 200 cm ÷ 25 cm = 8*

Answers

1. a) 13 000 m
b) 14 200 cm
c) 3600 m
d) 955 cm
e) 350 m
f) 40 000 cm

2. 20 copies; 5 m = 500 cm, 500 cm ÷ 25 cm = 20

3. For example, 6 months, 3 weeks, and 6 days

4. For example, 10 years, 6 months, 2 weeks, and 4 days

5. a) 5:30 p.m.
b) 10:40 a.m.
c) 9:25 p.m.

6. a) For example, about an hour and a half
b) 1 h 32 min

7. a) For example, about 8 hours
b) 8 h 23 min
c) 2 h 36 min

You will need

- base ten blocks

Getting Started

Making Dreamcatchers

Anna and her grandmother are making dreamcatchers as gifts.

They need 65 cm of willow and 24 cm of leather cord for each dreamcatcher.

They started with 7 m of willow and 3 m of cord.

They have made eight dreamcatchers so far.

? Do Anna and her grandmother have enough willow and cord to make three more dreamcatchers?

A. How many centimetres of willow and leather cord did Anna and her grandmother use to make eight dreamcatchers? Show your work.

B. How can you tell that they used between 5 m and 6 m of willow and almost 2 m of cord to make eight dreamcatchers?

C. Do they have enough willow and cord to make three more dreamcatchers? Show your work.

Do You Remember?

1. Estimate. Show your work.
a) 5×47 **b)** $6\overline{)28}$

2. Calculate, using mental math.
a) $6 \times 1000 =$ ■ **b)** $24 \div 3 =$ ■

3. Calculate, using base ten blocks.
a) 23×4 **b)** $54\overline{)2}$

4. Calculate.
a) $46 \times 3 =$ ■ **b)** $87 \div 6 =$ ■

5. Julia has 67 tulips to put in bunches of 4.
How many bunches of tulips can she make?
What will the **remainder** be? Show your work.

Getting Started

Making Dreamcatchers

Materials	• base ten blocks • ball of string

1. Using the Activity

(Whole Class/Pairs) ▸ 25–35 min

Have students turn to Getting Started and look at the picture of the dreamcatcher. Ask students what they know about dreamcatchers. Have them describe dreamcatchers they own or have seen. Tell students that, although the origin of dreamcatchers is not known for certain, it is believed they originated with the Ojibwe (*Anishinabe*) people. Today, Indigenous artists from many nations make dreamcatchers.

Measure and cut 24 cm of string. Tell students this string represents the amount of leather cord needed to make one dreamcatcher. Ask students to estimate how many centimetres they think would be needed to make a dreamcatcher for each student in the class. Have students share their estimation strategies. Together read and discuss the central question. Students can work in pairs to complete prompts A to C.

Prompt A Encourage students to estimate the answer before multiplying by asking if the answers will be more than or less than 1 m and have them explain.

Prompt B Ensure that all students can show that 1 m = 100 cm. Have students model the lengths using a metre stick or a measuring tape.

2. Using Do You Remember?

(Individual) ▸ 15–25 min

Observe individual students to see if they can correctly answer each question. Note the strategies used.

1. A range of reasonable answers should be accepted for each question.

3. Although some students may not require concrete materials to answer these questions, ask all students to use the blocks. Their manipulation of the blocks will provide an opportunity for you to observe their conceptual understanding.

4. Not all students will use the standard algorithm. The purpose of the question is to allow you to observe the calculation method used. Build on this throughout the chapter. Remind students to show their work.

Answers

A. 192 cm of leather cord (8 × 24 cm) and 520 cm of willow (8 × 65 cm)

B. For example, 1 m = 100 cm, so 2 m = 200 cm and 5 m = 500 cm. 192 cm is almost 200 cm, so it is almost 2 m; 520 cm is more than 500 cm, so it is more than 5 m, but less than 6 m, because 6 m = 600 cm.

C. They have enough leather cord; for example, they would need 72 cm more leather cord (3 × 24 cm), and would use a total of 192 cm + 72 cm = 264 cm leather cord. 3 m = 300 cm, and 264 cm is less than 300 cm, so they have enough cord. They do not have enough willow; for example, they would need 195 cm more willow (3 × 65 cm), and would use a total of 520 cm + 195 cm = 715 cm willow. 7 m = 700 cm, and 715 cm is more than 700 cm, so they do not have enough willow.

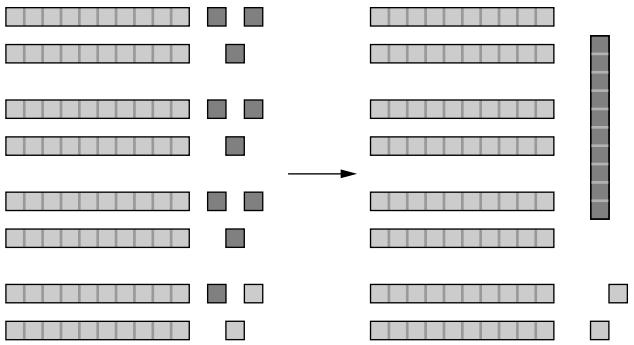
1. a) For example, I can round 47 up to 50. 50 × 5 = 250. I can also round 47 down to 45, 45 × 5 = 225. 47 is closer to 45 than 50, so I'll estimate about 230.

b) For example, I can round 28 up to 30. 30 ÷ 6 = 5, so I estimate the answer is about 5.

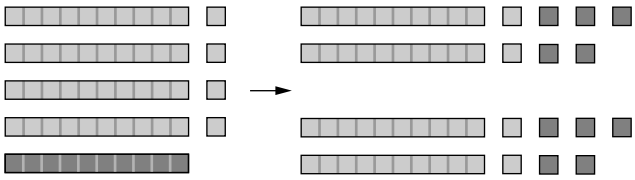
2. a) 6000

b) 8

3. a) 92; for example,



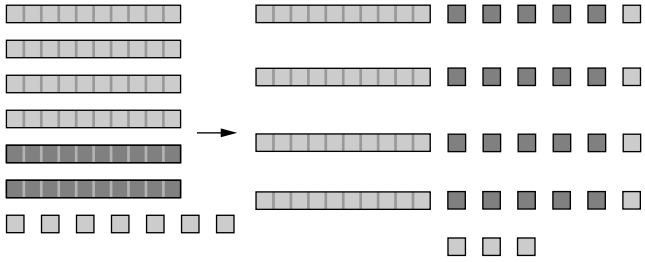
b) 27; for example,



4. a) 138

b) 14 R 3

5. Julia can make 16 bunches with 3 tulips left over.



CHAPTER 6

A Estimating Quotients

You will need

- a calculator

Goal **Use estimates to solve problems.**

Sofia is doing a report on extreme weather.

She discovers that, at La Réunion Island, it once rained 465 cm in six days. She thinks this amount of water is higher than her school!

She wonders how much rain that was each day.

? About how many centimetres of rain fell each day?

Sofia's Estimates

I'll assume the same amount of rain fell each day. That's 465 cm ÷ 6.

I'll make two estimates for the number of centimetres of rain that fell each day.

First I'll underestimate, and then I'll overestimate.

Then I'll choose an estimate between these two estimates.

465 is between 420 and 480, so first I'll divide 420 by 6. Then I'll divide 480 by 6.

A. Complete Sofia's two estimates. Explain how to use mental math to divide 420 by 6 and 480 by 6.

B. About how many centimetres of rain fell each day? Explain.

C. Was your estimate reasonable? Use a calculator to check.

Reflecting

1. Why do you think Sofia chose the numbers 420 and 480 for her two estimates?
2. Imagine that 465 cm of rain fell in four days instead of in six days. What numbers might you choose for overestimating and underestimating? Explain.
3. Why does it make more sense to estimate than to calculate the amount of rainfall each day?

Checking

4. In one eight-day period, 528 cm of rain fell on La Réunion Island.
   a) Show how to overestimate and underestimate the amount of rain that fell each day. Assume that about the same amount fell each day.
   b) How can you use your two estimates to make a closer estimate?

Practising

5. Overestimate and underestimate each division. Show the numbers you used to estimate.
   a) $2\overline{)151}$ c) $3\overline{)428}$ e) $6\overline{)364}$
   b) $9\overline{)665}$ d) $8\overline{)586}$ f) $7\overline{)523}$
6. Estimate to solve each problem. Explain how you estimated.
   a) In July, 528 people attended day camp over 7 days. In August, 293 people attended over 3 days. About the same number of campers attended on each day. Which month had the greater daily attendance?
   b) The cost of six MP3 players is $513. The cost of five boomboxes is $319. Which costs more, an MP3 player or a boombox?

A Estimating Quotients

Guided Activity

Materials	• calculators
Masters	• (optional) Number Lines, Masters Booklet p. 37

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• use estimation strategies to solve number problems	• Students will overestimate and underestimate to find reasonable quotients when dividing three-digit numbers by one-digit numbers.	• Students who have difficulty determining appropriate ranges can highlight the first two digits in each number and use a multiplication chart to find a multiple slightly less than and slightly more than the number.

1. Introduction (Whole Class) ▸ 5–10 min

Place a blank number line on the board or overhead. Give students a number and ask them to find a multiple greater than and less than that number. For example, what multiples of 9 are close to 279? Think of numbers rounded to tens. Students should suggest 270 and 300. Have them place these numbers on the number line. Continue with other numbers, for example, multiples of 9 close to 112, or multiples of 7 close to 513.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Before students turn to the lesson, read the information about the rainfall and discuss how much 465 cm is. Ask how many centimetres are in a metre and have students model 465 cm with metre sticks.

Read the central question and talk about why meteorologists report precipitation as a daily amount. It is important for students to realize that it is not probable that an equal amount of rain fell each day.

Ask students to turn to Lesson 6A and work in pairs to read Sofia's Estimates and complete prompts A to C.

Reflecting Use these questions to ensure that students can overestimate and underestimate and can explain the strategy they use. Encourage students to use math language.

Sample Discourse

1. • *Both numbers are easy to divide by 6 and 420 is less than 465 and 480 is greater than 465.*

2. • *465 is close to 480, so I could use 480 ÷ 4 = 120, and overestimate that about 120 cm fell each day for 4 days. To underestimate, I could use 440 ÷ 4 = 110 and say about 110 cm fell each day for 4 days.*

3. • *The amount of rainfall was probably not exactly the same each day so an estimate makes more sense.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

4. b) Discuss whether the daily amount is closer to the over- or underestimate. Have students mark the amounts on a number line.

Practising (Individual)

5. Use Assessment Tool 8, Masters Booklet p. 10, to assess anwers for this key assessment question.

Closing (Whole Class)

Have students choose two parts from Question 5 and one part from Question 6 to solve and explain in their notebooks.

Answers

A. For example, 42 ÷ 6 = 7 so 420 ÷ 6 = 70, and 48 ÷ 6 = 8 so 480 ÷ 6 = 80

B. For example, about 78 cm, because the actual answer will be between 70 cm and 80 cm, but closer to 80 cm.

C. For example, my estimate was reasonable, because 465 ÷ 6 = 77.5, which is almost 78.

1.–3. See sample answers under Reflecting.

4. a) For example, 480 and 560 are both easy to divide by 8 480 ÷ 8 = 60 and 560 ÷ 8 = 70. My underestimate is 60 cm and my overestimate is 70 cm.

b) For example, 528 is about halfway between 480 and 560, so I can estimate about 65 cm.

5. a) For example, 140 ÷ 2 = 70 and 160 ÷ 2 = 80, so 151 ÷ 2 is about 75.

b) For example, 630 ÷ 9 = 70 and 720 ÷ 9 = 80, so 665 ÷ 9 is about 75.

c) For example, 420 ÷ 3 = 140 and 450 ÷ 3 = 150, so 428 ÷ 3 is about 142.

d) For example, 560 ÷ 8 = 70 and 640 ÷ 8 = 80, so 586 ÷ 8 is about 75.

e) For example, 360 ÷ 6 = 60 and 364 is close to 360, so I don't have to overestimate. 364 ÷ 6 is about 60.

f) For example, 490 ÷ 7 = 70 and 560 ÷ 7 = 80, so 523 ÷ 7 is about 75.

6. a) August; for example, July camp's daily attendance is between 490 ÷ 7 = 70 and 560 ÷7 = 80. 293 is between 270 and 300, so the August camp's daily attendance is between 270 ÷ 3 = 90 and 300 ÷ 3 = 100.

b) MP3 player, for example, the cost of an MP3 player is between \$480 ÷ 6 = \$80 and \$540 ÷ 6 = \$90. \$319 is between \$300 and \$350, so the cost of a boombox is between \$300 ÷ 5 = \$60 and \$350 ÷ 5 = \$70.

CHAPTER 6

B Dividing Three-Digit Numbers

You will need

- base ten blocks

Goal **Use base ten blocks and pencil and paper to divide a three-digit number by a one-digit number.**

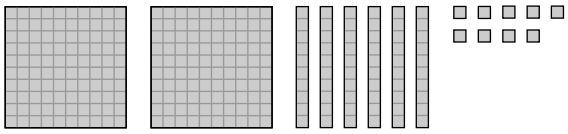
Liam, Alain, and Jose won 269 tickets that they can trade for prizes.

? If they share the tickets equally, how many tickets will each boy get?

Liam's Division

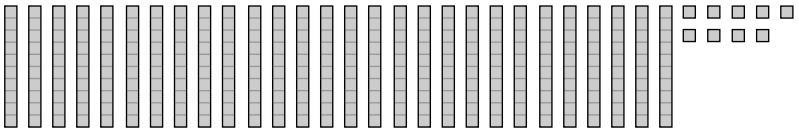
I estimate that we'll each get fewer than 100 tickets because there are close to 300 tickets and $300 \div 3 = 100$.

Step 1 I'll model 269 and record the division.



$3\overline{)269}$

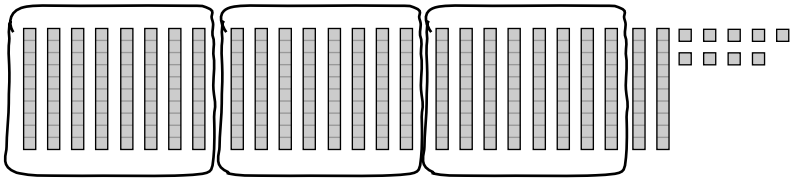
Step 2 I need to put the blocks in 3 equal groups.
I have only 2 hundreds, not 3.
There aren't enough to give us each 100 tickets.
I'll regroup the 2 hundreds as 20 tens.



$3\overline{)269}$

Step 3 Now I can put 8 tens in each group.

There are 2 tens and 9 ones left to divide.



$$\begin{array}{r} 8 \\ 3\overline{)269} \\ -240 \\ \hline 29 \end{array}$$

Jose's Division

I'll use multiplication to divide.

Step 1 $269 \div 3 = \blacksquare$ means that $3 \times \blacksquare = 269$

$3 \times 80 = 240$ and $3 \times 90 = 270$, so the answer is more than 80 but less than 90.

I have 29 left to divide.
$3 \times 9 = 27$

$$\begin{array}{r|l} 3\overline{)269} & \\ -240 & \left.\begin{array}{l} 80 \\ 9 \end{array}\right\} \blacksquare \\ \hline 29 & \\ -27 & \\ \hline \blacksquare & \end{array}$$

A. Complete Liam's and Jose's divisions.

B. How many tickets will each friend get? How many tickets will be left over?

Reflecting

1. In Step 3, why did Liam record the 8 tens above the 6 and not above the 2?
2. Why did Liam subtract 240 from 269?
3. How are Liam's and Jose's methods the same? How are they different?

Checking

4. Four friends win 315 tickets and share the tickets equally. How many tickets does each friend get? How many are left over? Show your work.

Practising

5. Calculate. Estimate to check that each answer is reasonable.
   a) $3\overline{)363}$ **b)** $3\overline{)201}$ **c)** $9\overline{)697}$ **d)** $8\overline{)650}$
6. Monique's grandfather has made 218 cookies for 7 families to share equally.
   a) Estimate the number of cookies each family will get.
   b) Calculate the number of cookies each family will get. How many cookies are left over?
   c) How many more cookies would each family get if there were 288 cookies instead of 218? Explain your answer.
7. Explain why you might estimate $654 \div 7$ using either $630 \div 7$ or $700 \div 7$.
8. Felicity has 4 times as many coins in her collection as Raven. Felicity has 332 coins. How many coins does Raven have?
9. Create and solve a problem that requires dividing a three-digit number by a one-digit number.

B Dividing Three-Digit Numbers

Guided Activity

Materials	• base ten blocks

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• divide numbers using concrete materials, drawings, and symbols	• Students will divide a three-digit number by a one-digit number using base ten blocks and an appropriate algorithm.	• Some students may make errors in multiplication and division facts. Allow students access to multiplication tables.

1. Introduction (Whole Class) ▸ 5–10 min

Show students a large stack of paper. Tell them that there are 846 sheets of paper in the stack and that you are going to put the paper into file folders. You want to put 4 sheets in each folder and you need to know how many folders you will need. Discuss with students why counting out sets of 4 is not the most efficient way to complete this task. Ask them what operation can be used to solve the problem.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to turn to Lesson 6B. As a class, read about the tickets and the central question. Have pairs of students model the tickets with the base ten blocks. One partner should read and model Liam's Division. The other partner should read Jose's Division. They should demonstrate their methods to each other, then complete prompts A and B.

Reflecting Use these questions to ensure that students see the connections between the two division methods.

Sample Discourse

1. • *8 goes above the 6 because it stands for 8 tens, not 8 hundreds.*

2. • *He had shared out 240 of the tickets. He wanted to find out how many tickets were left to share.*

• *Liam knew that 80 × 3 = 240, so he subtracted 240 from 269 to see how many tickets were left.*

3. • *They both start by figuring out how many tens they can put in each group, and then figure out how many ones. The difference is that Liam divides and Jose multiplies.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

4. Have students describe how they would estimate.

Practising (Individual)

Encourage students to continue to model problems using base ten blocks and to check their answers using estimation.

5. Use Assessment Tool 8, Masters Booklet p. 10, to assess answers for this key assessment question.

Closing (Whole Class)

Have students explain whether they prefer to use Liam's division method or Jose's, and why.

Answers

A. Liam's division:

$$\begin{array}{r} 89\ \text{R}2 \\ 3\overline{)269} \\ -\ 240 \\ \hline 29 \\ -\ 27 \\ \hline 2 \end{array}$$

Jose's division:

$$\begin{array}{r|l} 3\overline{)269} & \\ -\ 240 & 80 \\ \hline 29 & \\ -\ 27 & 9 \\ \hline 2 & \end{array} \quad \Big\} 89\ \text{R}2$$

B. Each friend will get 89 tickets and there will be 2 left over.

1.–3. See sample answers under Reflecting.

4.

$$\begin{array}{r|l} 4\overline{)315} & \\ -\ 280 & 70 \\ \hline 35 & \\ -\ 32 & 8 \\ \hline 3 & \end{array} \quad \Big\} 7$$

5. a) 121; 363 ÷ 3 is close to 360 ÷ 3 = 120, so 121 is reasonable.

b) 67; 201 ÷ 3 is a bit less than 210 ÷ 3 = 70, so 67 is reasonable.

c) 77 R4; 97 ÷ 9 is a bit less than 720 ÷ 9 = 80, so 77 R4 is reasonable.

d) 81 R2. 650 ÷ 8 is close to 640 ÷ 8 = 80, so 81 R2 is reasonable.

6. a) For example, about 30 cookies

b) 31 cookies; 1 cookie left over

c) For example, 288 is 70 more than 218, so there would be 70 extra cookies to share among 7 families, giving each family an extra 10 cookies. There would still be 1 cookie left over.

7. For example, both numbers are close to 654 and are easily divided by 7. 630 is an underestimate and 700 is an overestimate.

8. 83 coins

9. For example, $338 is to be shared equally by 6 people. How much money does each person get? 56 R2

LESSON

Skills Bank

A

1. In one five-day period, 182 cm of snow fell on Cartwright, Newfoundland.
Assume the same amount of snow fell each day.
a) Show how to overestimate and underestimate the amount of snow that fell each day.
b) Use your two estimates to make a closer estimate. Explain your thinking.

2. A five-day snowfall buried Kitimat, British Columbia, under 246 cm of snow. About how much snow fell each day?

3. Ian has 350 marbles. He has 3 times as many marbles as Matthew.
About how many marbles does Matthew have? Show your work.

4. A movie store rented 335 DVDs in 2 days and 448 VHS tapes in 3 days.
The store rented about the same number of DVDs and tapes each day.
Which type of movie had the greater daily rental? Estimate to solve the problem.
Explain your reasoning.

B

5. Calculate.
a) $6\overline{)384}$
b) $3\overline{)197}$
c) $8\overline{)265}$
d) $9\overline{)555}$
e) $4\overline{)547}$
f) $7\overline{)780}$

6. A community skating arena has 4 sections of seats.
368 fans attended a hockey game.
An equal number of fans sat in each section.
How many fans were in each section?

7. The arena snack bar bought 328 wieners to make hot dogs to sell at the game.
There are 8 buns in a package.
How many packages of buns are needed for 328 hot dogs?

Skills Bank Lessons A and B

Using the Skills Bank

1. & 2. Students may work in pairs to complete each question orally. Students should take turns and be encouraged to explain their thinking. They may check their estimates using calculators.

6. Students may use base ten blocks to model problems. Encourage them to check their answers using estimation.

Answers

1. a) For example, I'll use 150 to underestimate and 200 to overestimate. $5 \times 30 = 150$ and $5 \times 40 = 200$, so $182 \div 5$ is between 150 and 200. 35 is halfway between 30 and 40. 182 is closer to 200, so about 40 cm of snow fell.

b) For example, 175 is halfway between 150 and 200. $150 \div 5 = 30$, and $25 \div 5 = 5$, so $175 \div 5 = 35$. Since 182 is a little more than 175, a better estimate of the daily amount of snow is a little more than 35 cm.

2. For example, about 50 cm

3. For example, $3 \times 110 = 330$ and $3 \times 120 = 360$, so $350 \div 3$ is between 110 and 120. 115 is halfway between 110 and 120, so I'll estimate about 115 marbles.

4. For example, 335 is between 320 and 340, so the number of DVDs rented daily is between 160 ($320 \div 2$) and 170 ($340 \div 2$). 448 is between 420 and 450, so the number of VHS tapes rented daily is between 140 ($420 \div 3$) and 150 ($450 \div 3$). More DVDs are rented daily.

5. a) 64

b) 65 R2

c) 33 R1

d) 61 R6

e) 136 R3

f) 111 R3

6. 92 fans

7. 41 packages ($328 \div 8 = 41$)

Chapter Review

LESSON

A

1. Corinne wants to read a book with 192 pages in 9 nine days.
She plans to read the same number of pages each day.
Estimate the number of pages she will read each day.
Show your work.

2. In one week in Greenwood, Nova Scotia, 139 cm of snow fell.
If the same amount of snow fell each day, about how much snow fell each day? Show your work.

3. **a)** Nine pairs of ski poles cost $381.
Seven pairs of ski goggles cost $469.
Estimate to decide whether one pair of ski poles or one pair of goggles costs more. Explain your reasoning.

b) Five deluxe sets of pencil crayons cost $117.
Six boxes of oil paints cost $166.
Estimate to decide whether one set of pencil crayons or one box of paints costs more. Explain your reasoning.

B

4. Calculate.

a) $6\overline{)528}$
b) $7\overline{)286}$
c) $4\overline{)153}$
d) $5\overline{)449}$
e) $7\overline{)639}$
f) $9\overline{)393}$
g) $6\overline{)888}$
h) $8\overline{)870}$

5. **a)** Darlene made 312 cookies for 6 families to share equally.
How many cookies will each family get?

b) Suppose there were 618 cookies instead of 312.
How many more cookies would each of the 6 families get?

6. Nihaal is arranging 307 quarters in piles of 4 so that he can count the amount of money in dollars.
How many whole dollars does he have?
How many quarters are left over?

Chapter Review Lessons A and B

Using the Chapter Review

Use this supplemental chapter review to assess students' understanding of the concepts developed in Lessons 6A and 6B. All questions can be used for summative assessment.

Materials	• base ten blocks (1 set/student)
Masters	• Manipulatives Substitute: base ten blocks, Masters Booklet pp. 38–40

1.–6. Provide base ten blocks for those students who want to use them.

4. Encourage students to check their answers using estimation.

Related Questions to Ask

Ask	Possible Response
About **Question 2**: • If the 139 cm of snow fell in 4 days, about how much snow fell each day? Show your work.	• *For example, about 35 cm. I can overestimate by thinking 160 cm ÷ 4 = 40 cm and I can underestimate by thinking 120 cm ÷ 4 = 30 cm. 139 cm is halfway between 120 and 160, so I'll estimate 35 cm, which is halfway between 30 cm and 40 cm.*

Answers

1. For example, about 20; $9 \times 20 = 180$ and $9 \times 30 = 270$. 192 is between 180 and 270, but it is much closer to 180 cm.

2. For example, about 20 cm; $7 \times 20 = 140$ which is very close to 139.

3. a) For example, the goggles cost more. 381 is between 360 and 450, so one pair of ski poles costs between \$40 (360 ÷ 9) and \$50 (450 ÷ 9). 469 is between 420 and 490, so a pair of ski goggles costs between \$60 (420 ÷ 7) and \$70 (490 ÷ 7).

b) For example, the paints cost more. 117 is between 100 and 125, so a set of pencil crayons costs between \$20 (100 ÷ 5) and \$25 (125 ÷ 5). 166 is close to 180, so a box of oil paints costs close to \$30 (180 ÷ 6).

4. a) 88
b) 40 R6
c) 38 R1
d) 89 R4
e) 91 R2
f) 43 R6
g) 148
h) 108 R6

5. a) 52 cookies **b)** 103 cookies

6. \$76 with 3 quarters left over

CHAPTER 7

A Constructing Triangles

You will need

- a ruler

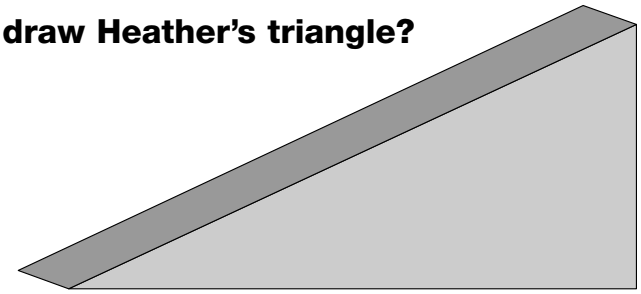
- a protractor

Goal **Draw triangles with given side lengths and angle measures.**

Heather made a model of a ramp used in stunt shows.
The side of the ramp is a triangle with one side length of 6 cm.
The angles are measured in **degrees (°)**.
One angle of the triangle is 90° and another is 25°.

degree (°)
A unit for measuring angles.
45 degrees can be written as 45°.

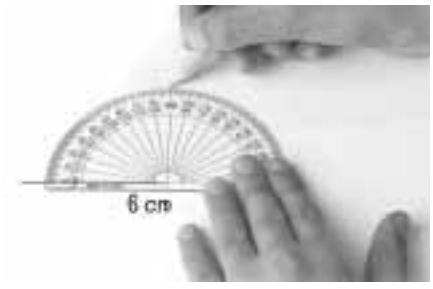
? How can you draw Heather's triangle?

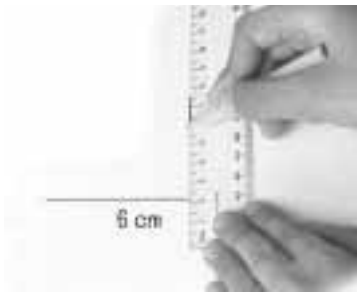


Aaron's Solution

Step 1 I drew a line segment 6 cm long and labelled it.

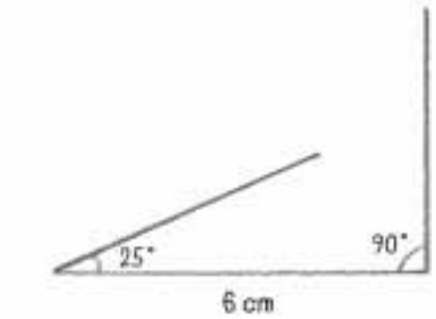
Step 2 On one end of the line segment, I drew an angle that is 90° and labelled it.

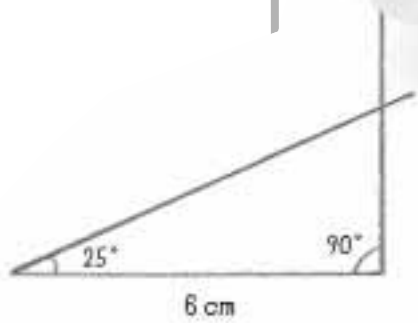




Step 3 At the other end of the first line segment, I drew an angle that is 25° and labelled it.

Step 4 I used a ruler to make the sides longer. I kept making them longer until they met to make a triangle. Then I erased the extra lengths.





Reflecting

1. Suppose Aaron had drawn the 90° angle before drawing the 6 cm side. How could he have completed the triangle?
2. How else could he have drawn the triangle?

Checking

3. Draw a triangle with a side length of 6 cm and two 45° angles.

Practising

4. **a)** Draw a triangle with one side 8 cm long, one 50° angle, and one 85° angle.
   b) Compare your triangle with a classmate's triangle.
5. **a)** Draw two different triangles that have an angle of 90° and a side length of 7 cm.
   b) Compare your triangles with a classmate's triangles.
6. **a)** Draw a triangle in which two of the side lengths are 4 cm and 6 cm and the angle between these sides is 60°.
   b) Compare your triangle with a classmate's triangle.
7. Two triangles have one side and two angles the same. Do the triangles have to be congruent? Use an example to explain.

A Constructing Triangles

Direct Instruction

Materials	• rulers, protractors

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• construct a triangle given side lengths and angle measures	• Students will draw an appropriate triangle using the side lengths and angle measures given.	• Students may draw one side and one angle, but not know how to proceed with the second angle or side to finish the triangle. Students may need prompts as to where to draw the second side or second angle.

1. Introduction (Whole Class) ▸ 5–10 min

Draw a 4 cm square. Ask students how they would instruct a classmate to draw an identical shape. Prompt students so they understand they need to identify the shape and provide measurements. Discuss the information needed to draw a triangle. Draw a right-angled triangle on the board that has one side length of 6 cm. Ask what information students need to draw an identical triangle.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Ask students to turn to Lesson 7A. As a class, read about Heather's triangle. Read the highlighted definition for *degree* and, if necessary, review with students how to use a protractor. Discuss the central question and have students work through Aaron's Solution. Make sure students understand that any one of the three angles could be the angle that measures 25°.

Reflecting Use these questions to ensure that students can construct a triangle when they know two angles measures and one side length.

Sample Discourse

1. • *Aaron could have extended one arm of the angle and then measured 6 cm along it from the vertex at the 90° angle. Then he could draw the rest of the triangle in the same way he did before.*

2. • *Aaron could have drawn the 90° angle on the other end of the 6 cm line segment. That's how the triangle would look if you looked at the ramp from the other side.*

• *He could have drawn the 6 cm line, then the 25° angle, and then the 90° angle.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Make sure students understand that it doesn't matter whether they construct one of the 45° angles first or whether they draw the line segment first.

Practising (Individual/Pairs)

4.–6. Encourage students to observe and discuss whether triangles in each case are congruent or not.

4. Use Assessment Tool 8, Masters Booklet p. 10, to assess answers for this key assessment question.

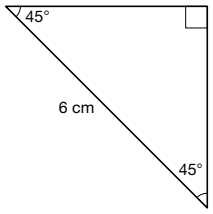
Closing (Whole Class)

Have students describe how to construct triangles when some information about side lengths and angles measures is given.

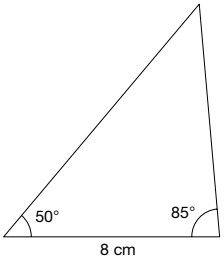
Answers

1.–2. See sample answers under Reflecting.

3. For example,

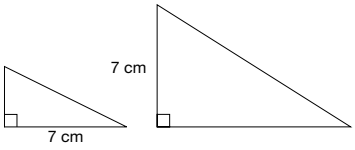


4. a) For example,



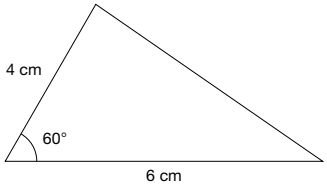
b) For example, our triangles were the same shape and size, but were opposite.

5. a) For example,



b) For example, my triangle was much smaller and not as long.

6. For example,



b) Our triangles were congruent.

7. No; for example, in Heather's triangle, the side that is 6 cm might be any of the sides, and in each position, you would get a different size of triangle.

CHAPTER 8

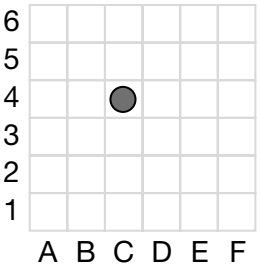
A Locations on a Map

Goal **Use coordinates and directions to identify and describe locations on a map.**

Karin has just moved to Ottawa. Her first swim class is today, right after school. She locates the pool on a map. Then she asks Anna to describe the fastest route from school to the pool.

? How can you identify and describe locations using coordinates and compass directions?

coordinates
A way of describing the location of spaces or objects



The counter is on C4.

Karin's Description

This map uses coordinates to describe locations.

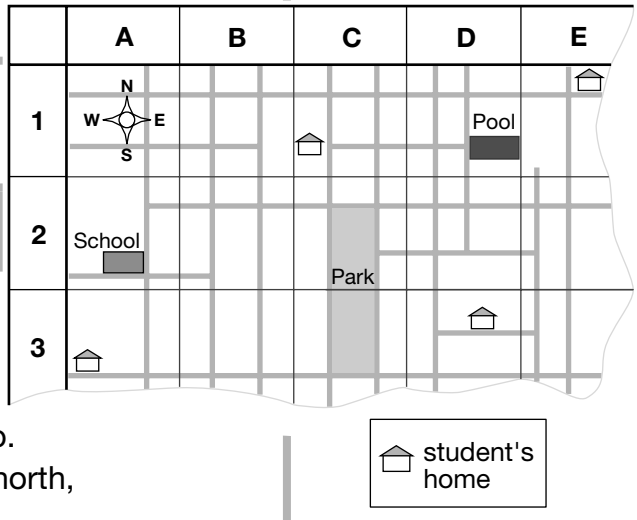
The pool is below the D and across from the 1.

It is in section D1 of the map.

Anna's Description

Go east from the school for one block. Cross the street. Then walk north.

Turn east at the first street you come to. Walk four blocks east, then one block north, and then one block east.



A. Karin's home is south of the pool. Describe the location of her home and a way she can walk there from the pool.

B. Anna's home is west of the pool. Where is it on the grid? Describe a way Anna can walk to Karin's home.

C. Dan's home is in section E1 of the grid. Yoshi's home is two grid squares south and four grid squares west of Dan's. Dan walks past the park on his way to Yoshi's. Describe a route he might take.

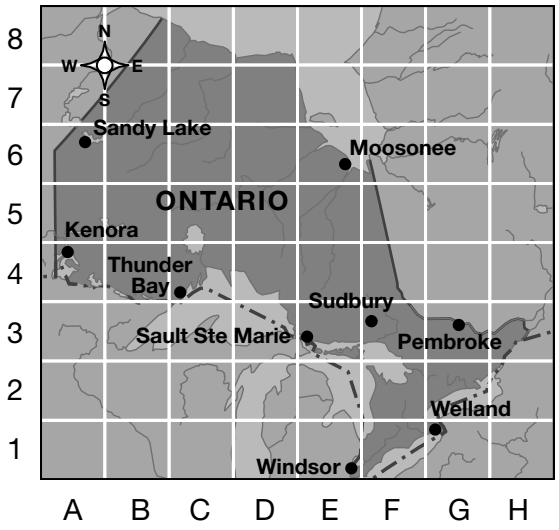
Reflecting

1. How would Anna's directions for going from the school to the pool change if she were going from the pool to the school instead?

2. A coordinate grid is useful for describing a location. Directions involving north, east, south, and west are better for describing how to get from one place to another. Why?

Checking

3. **a)** Describe the location of the school.
b) Describe the location of the park.
c) Describe a way Karin can walk home from school without passing the park.



Practising

4. Describe a way each student can walk to school.
a) Dan **b)** Yoshi **c)** Anna

5. Use the coordinates to describe the location of each town or city on the map.
a) Welland **b)** Sault Ste. Marie
c) Windsor **d)** Pembroke

6. **a)** What town is three grid squares north and five grid squares west of Sudbury?
b) What city is two grid squares south and two grid squares west of Moosonee?

A Locations on a Map

Direct Instruction

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• describe locations and movement on a map using directional terms	• Students will correctly describe locations and movement on a map using the directional words *north, south, east,* or *west.*	• Some students may be more familiar with the terms *right, left, up, down, top,* and *bottom* when reading a map. Relate the directional terms *north, south, east,* and *west* to the terms they are familiar with by asking questions such as, "North is at the top of the map. What direction is at the bottom?"

1. Introduction (Whole Class) ▸ 5–10 min

Introduce students to the directional words *north, south, east,* and *west*. Suggest to students that they use a mnemonic such as "Never Eat Squished Worms" to help them remember the clockwise sequence of the directions on a compass.

Draw attention to the compass rose on the map shown in Lesson 8A. Alternatively, display a large map and identify the four directions in relation to the classroom. Place oversized copies of the letters N, E, S, and W on the four classroom walls to indicate the directions north, east, south, and west. Discuss which direction students are facing as they stand beside their desks. Ask them to face north. Then, have students make a quarter turn to their left and have them point to the north (to their right). Next, have students make another quarter turn to their left and point north (behind them). Finally, have students make one more quarter turn and point north (to their left). Discuss with students how it does not matter which direction they are facing, the direction north is always the same. Identify the other points of the compass. Ask each student to think about where they live in relation to the school.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Ask students to turn to Lesson 8A. As a class, read about Karin and the central question. Read the highlighted definition for *coordinates*. Work through Karin's Description and Anna's Description, with students using their fingers to follow Anna's directions on the map. Make sure students can identify the directions of the compass using the compass rose. Together, work through prompts A to C.

Reflecting Use these questions to ensure that students understand the practical application of using a location grid and directional words to provide directions.

Sample Discourse

1. • *It would be like the school-to-pool route, except for east say west and for north say south, and then say the block counts backward.*

• *The directions would all be the opposite.*

2. • *A location is in one particular spot, but a route can involve going in more than one direction.*

• *A grid helps you find an exact spot, but if you gave directions using a coordinate grid, you would have to have the map to understand them. Directions are better for describing how to get somewhere because you can visualize the way you will travel, even if you don't have a map.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Remind students that they can find the grid location of Karin's house from the information provided in prompt A.

Practising (Individual)

4. Remind students that they can find the grid locations of Dan, Yoshi, and Anna from the information provided in prompts B and C, and that there is more than one possible way for each student to walk to school.

Use Assessment Tools 8 & 9, Masters Booklet pp. 10 & 11, to assess answers for this key assessment question.

Closing (Whole Class)

Ask students to describe the route they would take if they walked from their desk to the school office. Tell them to use directional words.

Answers

A. D3; for example, walk west 1 block, south 3 blocks, and east half a block.

B. C1; for example, walk 1 block south, 2 blocks east, 2 blocks south, and half a block east.

C. For example, walk west 2 blocks, south 5 blocks, and 6 blocks west.

1.–2. See sample answers under Reflecting.

3. a) A2 **b)** C2 and C3

c) For example, Karin could walk east 1 block, north 3 blocks, east 4 blocks, south 4 blocks, east half a block.

4. For example, **a)** 1 block south, 8 blocks west, 1 block south

b) 1 block east and 1 block north

c) 1 block south, 3 blocks west, 1 block south

5. a) G1 **b)** E3 **c)** E1 **d)** G3

6. a) Sandy Lake **b)** Thunder Bay

CHAPTER 11

A Volume of Rectangular Prisms

You will need

- centimetre linking cubes

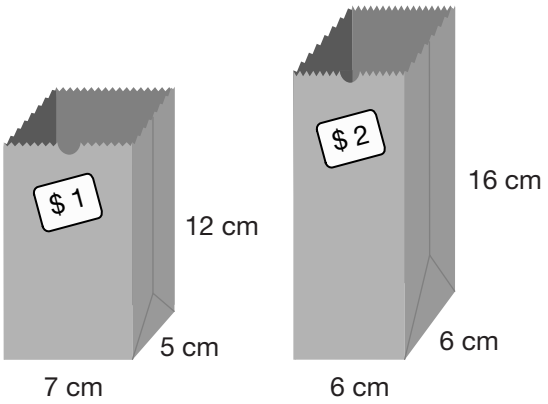
- calculator

Goal **Calculate the volume of rectangular prisms.**

Camille is selling bags of jellybeans at the school movie night.

She thinks a large bag will hold about two times as many jellybeans as the small bag.

? Will the $2 bag hold about twice as many jellybeans as the $1 bag?



cubic centimetre (cm^3)
A unit of measurement for volume

1 cm^3

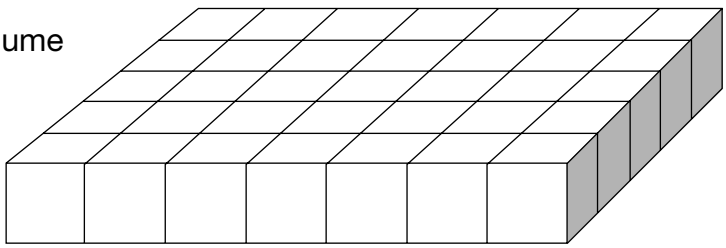
Camille's Strategy

I'll model the volume of each bag using centimetre cubes. Each cube has a volume of 1 **cubic centimetre (cm^3)**.

I can stack layers of cubes to make a rectangular prism and then count the number of cubes in the prism.

Each layer will be 1 cm high.

I'll start by calculating the volume of the $1 bag.
The base is a rectangle 7 cm long and 5 cm wide.
The number of centimetre cubes in the first layer is $7 \times 5 = 35$. The volume is 35 cm^3.



A. How many 1 cm layers does Camille need to make and stack to complete her model of the $1 bag?

B. Calculate the volume of the $1 bag.

C. Use Camille's strategy to calculate the volume of the $2 bag. Show your work.

D. Will the $2 bag hold about twice as many jellybeans as the $1 bag? Show your work.

Reflecting

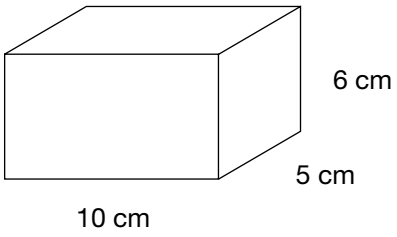
1. How can you calculate the volume of a rectangular prism if you know the area of the base?

2. Why can you write the rule for a rectangular prism as Volume = area of base × height?

Checking

3. **a)** What is the area of the base of the rectangular prism?

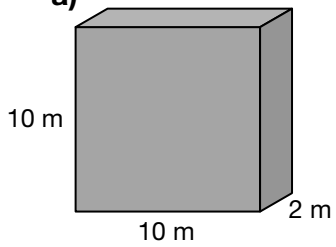
b) What is the volume of the prism?



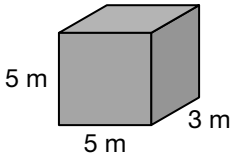
Practising

4. Calculate the volume of each rectangular prism.

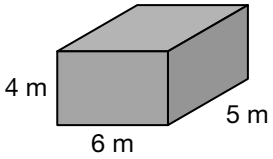
a)



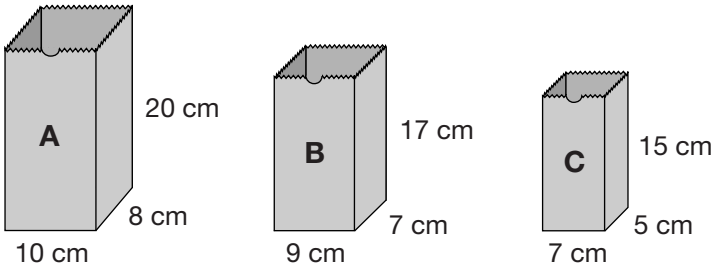
b)



c)



5. A bag company sells popcorn bags in different sizes.
Pierce wants bags with a volume close to 1000 cm^3.
Should he choose bag A, B, or C?
Explain your choice.



A Volume of Rectangular Prisms

Guided Activity

Materials	• linking cubes

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• calculate the volume of a rectangular prism	• Students will determine the volume of a rectangular prism by determining the volume of one layer, and then multiplying by the number of layers in the prism.	• Students may not realize that a 1 cm cube layer has height. Remind them that the volume of a layer is the number of centimetre cubes that make up the layer. Explain that the number of layers in the rectangular prism is the same as the height because each layer is 1 cm high.

1. Introduction (Whole Class) ▸ 5–10 min

Review with students the definition of *volume* (the measure of the amount of space taken up by a 3-D shape). Show students boxes of different sizes (e.g., juice box, cereal box, packing box) and ask students to put the boxes in order of least to greatest volume. Discuss how they know which box has the greatest volume and which has the least.

2. Teaching and Learning (Whole Class) ▸ 15–20 min

Have students turn to Lesson 11A. Read together about Camille's problem and the central question, then work through Camille's Strategy. Students can make models of the bags with the linking cubes. Read also the highlighted definition for *cubic centimetre (cm^3)*. Once you are sure students understand that the number of layers is the same as the height, because each layer is 1 cm high, then have them work through prompts A to D in pairs.

Reflecting Use these questions to make sure students understand that, once they know the volume of a prism's base, they can multiply by the height to determine the volume of a rectangular prism.

Sample Discourse

1. • *You can multiply the area of the base by the height.*

2. • *Area of a rectangle = length × width so that's the same as finding the area of the base.*

• *Area of a rectangle = length × width and volume of a rectangle-based prism = length × width × height so volume = area of rectangular base × height.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Encourage students to use linking cubes to model the problem.

Practising (Individual)

4.–5. Students can determine the volumes by building models with linking cubes or by multiplying area of base 3 height.

4. Use Assessment Tool 8, Masters Booklet p. 10, to assess answers for this key assessment question.

Closing (Whole Class)

Have students determine the volume of objects in the classroom, such as a book or juice box.

Answers

A. 12 layers

B. \$1 bag: 35 cm^3 × 12 = 420 cm^3

C. \$2 bag: 6 × 6 = 36, 36 cm^3 × 16 = 576 cm^3

D. No; 572 ÷ 2 = 288, and 288 < 420

1.–2. See sample answers under Reflecting.

3. a) 50 cm^2

b) 300 cm^3

4. a) 200 m^3

b) 75 m^3

c) 120 m^3

5. Bag B; for example, volume of bag A = 1600 cm^3, volume of bag B = 1071 cm^3, and volume of bag C = 525 cm^3. The volume of bag B is closest to 1000 cm^3.

B Choosing a Unit to Measure Mass

Goal **Select and justify the most appropriate unit to measure mass.**

Martin researched animals and their masses but forgot to record the units of mass.

Animal	Mass
African elephant	3–6
Bee	80
Bowhead whale	100
Lion	100–200
Domestic cat	6
Mosquito	2
Mouse	21
Narwhal	2
Parakeet	40
Sea lion	200–1000
Sparrow	20
Spider	15

? Which masses are described in milligrams, grams, kilograms, and tonnes?

A. Which three animals on Martin's list do you think have masses measured in milligrams? Copy the chart below. Write the animals' names and masses in the first section of the chart, and explain your reasoning.

B. Repeat Part A for animals with masses measured in grams, in kilograms, and in tonnes. Complete the appropriate section in the chart.

Mass of Animals

Milligrams (mg)		Grams (g)		Kilograms (kg)		Tonnes (t)	
Animal	Mass	Animal	Mass	Animal	Mass	Animal	Mass
I think these masses will be in milligrams because …		I think these masses will be in grams because …		I think these masses will be in kilograms because …		I think these masses will be in tonnes because …	

Reflecting

1. Why might the mass of a walrus be described as 1400 kg instead of 1.4 t?
2. Which unit of mass was it hardest to think of examples for? Why?

B Choosing a Unit to Measure Mass

Exploration

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• choose appropriate units to measure mass	• select and justify the most appropriate standard unit to measure mass	• Students may not understand the relationships between and among milligrams, grams, kilograms, and tonnes. Post a reference. For example, 1 g = 1000 mg 1000 g = 1 kg 1 000 000 g = 1 t

1. Introduction (Whole Class) ▸ 5–10 min

Review with students the four units used in this lesson to measure mass: milligram, gram, kilogram, and tonne. Ask them to put the units in order from least mass to greatest mass. Ask them to choose the unit they would use to measure their own mass and to explain their choice.

2. Teaching and Learning (Whole Class/Pairs) ▸ 35–40 min

Have students turn to Lesson 11B. As a class, read about Martin and examine his chart, then read the central question. Have students work through prompts A and B in pairs. Students may share and discuss their results.

Reflecting Use these questions to ensure that students understand how to select appropriate units.

Sample Discourse

1. • *1400 is easier for me to read and say than 1.4.*
- *You could use 1400 kg if you're comparing the mass of a walrus to the masses of smaller animals that are given in kilograms, like sea lions or otters.*

2. • *It was hardest to think of animals that would have masses in tonnes, because it is hard to imagine how big a tonne is.*
- *It was hardest to think of animals that would have masses in milligrams, because that's so small.*

3. Consolidation ▸ 5–10 min

Closing (Whole Class)
Ask students to think of one more animal for each section of the chart.

Use Assessment tool 6, Masteres Booklet p. 8, to assess answers for this whole exploration.

Answers

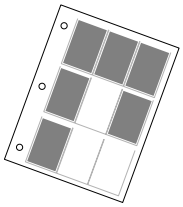
A.–B. For example,

Mass of Animals							
Milligrams (mg)		Grams (g)		Kilograms (kg)		Tonnes (t)	
Animal	Mass	Animal	Mass	Animal	Mass	Animal	Mass
Bee	80 mg	Mouse	21 g	Lion	100–200 kg	Bowhead whale	100 t
Spider	15 mg	Parakeet	40 g	Domestic cat	6 kg	Narwhal	2 t
Mosquito	2 mg	Sparrow	20 g	Sea lion	200–1000 kg	African elephant	3–6 t
Ant		Hummingbird		Dog		Rhinoceros	
I think these masses will be in milligrams because insects can be very small, like a few grains of salt.		I think these masses will be in grams because I don't think small birds or a mouse would weigh as much as a kilogram.		I think lions and sea lions will be in kilograms because these animals are sort of like humans in size and we are measured in kilograms. I think cats will also be in kilograms because they are much bigger than a small bird.		I think these masses will be in tonnes because these are really huge animals.	

1.–2. See sample answers under Reflecting.

CHAPTER 12

A Comparing and Ordering Fractions



Goal **Compare and order improper fractions and mixed numbers.**

Norman and Alain organized their hockey card collections in plastic sheets with 9 pockets.

Norman's Cards

Team	Number of full sheets	Number of pockets
Flames	3	5
Avalanche	1	2
Canadiens	2	7

Alain's Cards

Team	Number of cards
Leafs	33
Lightning	21
Flyers	13

? How can you order the teams according to the number of sheets of cards filled?

Norman's Comparison

I used the most sheets for Flames cards, $3\frac{5}{9}$ sheets.

Alain used the most sheets for Leafs cards, 33 cards. That's 33 ninths of a sheet.

$$\begin{array}{r} 3\ R6 \\ 9\overline{)33} \\ -27 \\ \hline 6 \end{array}$$

I can divide 33 by 9 to calculate the number of whole sheets Alain used for the Leafs and the number of cards left over.

Alain used 3 whole sheets for the Leafs. That's the same number of whole sheets as I used for the Flames.

One sheet had only 6 Leafs cards. That's $\frac{6}{9}$ sheets.

So $\frac{33}{9} = 3\frac{6}{9}$, and $3\frac{6}{9} > 3\frac{5}{9}$, so the Leafs cards filled the most sheets.

Alain's Comparison

I have 21 Lightning cards.

Norman filled 2 sheets with Canadiens cards. That's 2×9, or 18 cards. Then he has another 7 cards, so that's 25.

My Lightning cards filled fewer sheets than the Canadiens cards.

21 ninths of a sheet is less than 25 ninths.

A. Are there more sheets of Flyers cards or Avalanche cards?

B. Order the six teams from greatest to least number of sheets filled. Show your work.

Reflecting

1. Norman compared fractions using mixed numbers.
Alain used improper fractions.
Which way of comparing do you think is easier? Why?

Checking

2. Monique used $\frac{55}{9}$ plastic sheets and Liam used $5\frac{5}{9}$ plastic sheets to organize their baseball cards. Who had more cards, Monique or Liam? Show your work.

Practising

3. Compare the values using $<$ or $>$.

a) $\frac{4}{5} \blacksquare \frac{6}{5}$ **c)** $15\frac{1}{3} \blacksquare 13\frac{2}{3}$ **e)** $\frac{67}{5} \blacksquare 13\frac{4}{5}$

b) $\frac{19}{4} \blacksquare 7\frac{1}{4}$ **d)** $8\frac{5}{6} \blacksquare \frac{56}{6}$ **f)** $24\frac{3}{7} \blacksquare \frac{152}{7}$

4. Tom organized his CDs in a tower. He put one type of music on each shelf. Each shelf held 10 CDs.

a) Compare the number of classic rock CDs with the number of punk CDs.

b) Order the number of shelves used for each category from least to greatest.
Explain your strategy.

Category of CD	Number of shelves used
Classic rock	$3\frac{4}{10}$
Punk	$\frac{23}{10}$
Brit pop	$2\frac{9}{10}$
Alternative rock	$\frac{32}{10}$

5. **a)** Order these numbers from least to greatest.
$\frac{33}{8}$, $3\frac{6}{8}$, $1\frac{4}{8}$, $2\frac{1}{8}$, $\frac{7}{8}$, $2\frac{1}{8}$, $\frac{27}{8}$

b) List three mixed numbers between $2\frac{1}{5}$ and $5\frac{3}{5}$

c) List three improper fractions between $\frac{14}{6}$ and $\frac{41}{6}$.

A Comparing and Ordering Fractions

Guided Activity

Materials	• (optional) fraction strips or fraction circles

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• place improper fractions and mixed numbers in order	• Students will use concrete materials and drawings to compare and order improper fractions and mixed numbers with like denominators.	• Students may find it difficult to work with several values at one time. Have them compare two values at a time, determining which is greater, before moving on to compare a third to the first two.

1. Introduction (Whole Class) ▸ 5–10 min

Show students a series of fraction strips that illustrate $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, and 1. Ask them to place the strips in order from least to greatest. Discuss how the fraction strips help them see which is the least fraction and which is the greatest.

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Ask students to turn to Lesson 12A and read together about Norman's and Alain's hockey cards. Read the central question, then work through Norman's Comparison and Alain's Comparison together. Make sure students understand that when two fractions have the same denominator, the fraction with the greatest numerator has the greater value. Students can work through prompts A and B in pairs, and compare their results as a class.

Reflecting Use these questions to discuss and compare the two strategies with students.

Sample Discourse

1. • *I think Alain's method is easier, because the denominator is the same for all the improper fractions, so you just have to compare the numerators, which is like comparing whole numbers.*
- *I think Alain's method is easier, because multiplying is easier for me than dividing.*
- *I think they're about the same, because with Norman's method you divide and subtract to get the remainder, and with Alain's method, you have to multiply and then add, so that's two operations for each.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

2. Students may be confused by the similar digits in the two fractions. Remind them that they cannot simply place the whole number in front of the numerator to determine the equivalent improper fraction (e.g., $1\frac{1}{4} \neq \frac{11}{4}$). They must multiply the denominator by the whole number, then add the numerator, to get the equivalent improper fraction.

Practising (Individual)

3.–5. Some students may want to use fraction strips or fraction circles.

4. Use Assessment Tools 8, Masters Booklet p. 10, to assess answers for this key assessment question.

Closing (Whole Class)

Have students summarize how they would compare $2\frac{5}{6}$ and $\frac{13}{6}$.

Answers

A. Flyers cards; for example, $1\frac{4}{9} > 1\frac{2}{9}$

B. Leafs = $\frac{33}{9}$, Flames = $\frac{32}{9}$, Canadiens = $\frac{25}{9}$, Lightning = $\frac{21}{9}$, Flyers = $\frac{13}{9}$, Avalanche = $\frac{11}{9}$

1. See sample answers under Reflecting.

2. Monique; for example, $\frac{55}{9} = 6\frac{1}{9}$, and $6\frac{1}{9} > 5\frac{5}{9}$

3. a) $\frac{4}{5} < \frac{6}{5}$ **b)** $\frac{19}{4} < 7\frac{1}{4}$ **c)** $15\frac{1}{3} > 13\frac{2}{3}$
d) $8\frac{5}{6} < \frac{56}{6}$ **e)** $\frac{67}{5} < 13\frac{4}{5}$ **f)** $24\frac{3}{7} > \frac{152}{7}$

4. a) $3\frac{4}{10} > 2\frac{3}{10}$

b) $2\frac{3}{10}$, $2\frac{9}{10}$, $3\frac{2}{10}$, $3\frac{4}{10}$; for example, I renamed the improper fractions as mixed numbers. Then I compared the whole numbers. Because the denominator for each fraction is 10, once I have compared the whole numbers, I just have to compare the parts.

5. a) $\frac{7}{8}$, $1\frac{4}{8}$, $2\frac{1}{8}$, $\frac{21}{8}$, $\frac{27}{8}$, $3\frac{6}{8}$, $\frac{33}{8}$

b) For example, $2\frac{2}{5}$, $4\frac{1}{5}$, $4\frac{3}{5}$

c) For example $\frac{17}{6}$, $\frac{23}{6}$, $\frac{36}{6}$

CHAPTER 13

A Using Organized Lists

Goal **Use organized lists to list the possible outcomes of an experiment.**

Akiko is playing a game. Each player predicts the **outcome** for tossing 2 coins, and then tosses the coins. A player who predicts correctly scores 1 point.

? What outcome should Akiko choose?

outcome
A single result in a probability experiment. If you roll a die numbered 1 to 6, the possible outcomes are 1, 2, 3, 4, 5, and 6.

organized list
The strategy of following a certain order to find all possibilities

Akiko's List

Each coin might be heads or tails.

I'll make an **organized list** to show the possible outcomes.

There are 4 possible outcomes.

I'll choose 1 heads and 1 tails.

Possible Coin Tosses

1st coin	2nd coin	Outcome
heads	Heads	2 heads
heads	Tails	1 heads, 1 tails
tails	Heads	1 tails, 1 heads
tails	Tails	2 tails

Reflecting

1. How does Akiko's list show all the possible outcomes?
2. Why do you think Akiko chose 1 heads and 1 tails?

Checking

3. Sean started this organized list for tossing a coin and a die.

a) Copy and complete Sean's organized list.

b) How many possible outcomes are there?

c) Which is more likely, or are they equally likely?

- Toss heads and roll 3.
- Toss tails and roll 1.

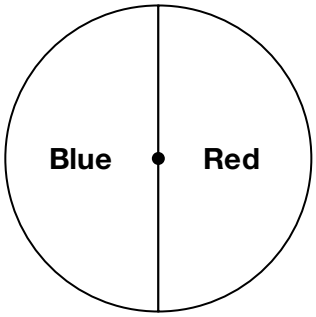
How does your organized list show this?

Possible Coin Tosses and Die Rolls

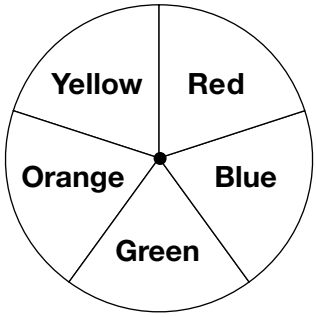
Coin	Die
heads	1
heads	2
heads	3

Practising

4. Caryn is spinning Spinner A and Spinner B.



Spinner A



Spinner B

a) Use an organized list to show the possible outcomes.

b) How many possible outcomes are there?

c) Which is more likely, or are they equally likely?

- Caryn will spin the same colour for both spins.
- Caryn will spin blue at least once.

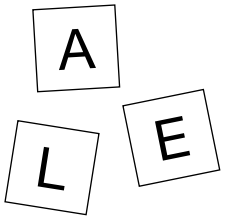
5. Lea printed each letter of her name on a piece of paper. She put the papers in a bag, drew one paper, put it back in the bag, and drew again.

a) Use an organized list to show the possible outcomes.

b) How many possible outcomes are there?

c) What outcomes are just as likely as drawing A both times?

d) What outcomes are just as likely as drawing A and E?



A Using Organized Lists

Direct Instruction

Materials	• (optional) dice, coins

Assessment for Feedback	What You Will See Students Doing…	
Students will	**When Students Understand**	**If Students Misunderstand**
• use an organized list to determine possible outcomes of an experiment	• uStudents will use organized lists efficiently and accurately to consider all possible outcomes to an experiment.	• uStudents may confuse this strategy with guess and test. Show students that with guess and test, you try to make accurate guesses, based on what you found out, then test your guess. With a list, you want to find all possibilities, not just one.

1. Introduction

(Whole Class/Pairs) ▸ 5–10 min

Pose a question about the results of an experiment: "Suppose you are rolling two dice. What results might you get?" Have students work in pairs to answer the question. You might make dice available for each pair. After a few minutes, ask students to share their answers and explain their strategies.

2. Teaching and Learning

(Whole Class/Pairs) ▸ 15–20 min

Direct students' attention to Lesson 13A. Together read about Akiko's game and the definition for *outcome*. Read the central question and work through Akiko's List. Discuss the meaning of *organized list*. Ask students how Akiko's organized list shows four possible outcomes.

Reflecting Students reflect on how an organized list helps them answer questions about the experiment.

Sample Discourse

1. • *The 4 possible outcomes are 2 heads, 1 heads and 1 tails, 1 heads and 1 tails, and 2 tails. You know they are all the possible outcomes because the list shows all the possible combinations of heads and tails in an organized way to make sure you don't miss any.*

2. • *2 of the 4 possible outcomes are 1 heads and 1 tails. Only 1 outcome is 2 heads and only 1 outcome is 2 tails. So 1 heads and 1 tails is more likely than any other outcome.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Students can use a coin and a die to model this problem.

Practising (Individual)

4. Students can record the words or the first letters in their organized lists; for example, blue or B.

Use Assessment Tool 8, Masters Booklet p.10, to assess answers to this key assessment question.

Closing (Whole Class)

Ask students what the advantages and disadvantages are of using an organized list to find all possible outcomes of an experiment.

Answers

1.–2. See sample answers under Reflecting.

3. a) Possible Coin Tosses and Die Rolls

Coin	Die
heads	1
heads	2
heads	3
heads	4
heads	5
heads	6
tails	1
tails	2
tails	3
tails	4
tails	5
tails	6

b) 12

c) Equally likely; For example, each is in my organized list once.

4. a) Possible Spins

Spinner A	Spinner B
blue	yellow
blue	red
blue	blue
blue	green
blue	orange
red	yellow
red	red
red	blue
red	green
red	orange

b) 10

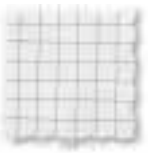
c) It is more likely that Caryn will spin blue at least once. For example, my organized list shows 6 possible outcomes with blue at least once and 2 possible outcomes with the same colour for both spins.

CHAPTER 13

B Using Area Models

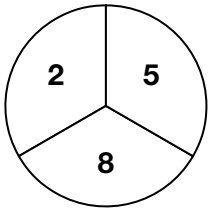
You will need

- grid paper



Goal **Use charts to find the possible outcomes of an experiment.**

Dan and Monique are playing a game with this spinner. A player spins twice. If the sum is *even*, the player chooses whether to move backward or forward on the gameboard. If the sum is *odd*, the player moves forward.



? Is it more likely, less likely, or just as likely that a player may choose to move forward or backward?

Dan's Model

I'll use a chart to show the possible outcomes. Each spin might be 2, 5, or 8. I'll record 2, 5, and 8 across the top and down the side of a chart. Then I'll record the numbers from the spinners.

	2	5	8
2	2, 2	2, 5	2, 8
5	5, 2		
8			

Monique's Model

I'll record the sum for each possible outcome.

	2	5	8
2	4	7	10
5	7		
8			

A. Copy and complete each chart. How many possible outcomes are there?

B. How many possible outcomes are *even*?

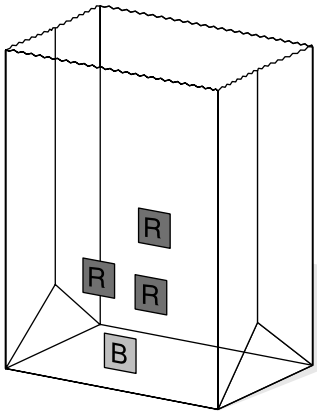
C. Is it more likely, less likely, or just as likely that a player may spin an even sum and choose whether to move forward or backward? How do you know?

Reflecting

1. How do you know that Dan's and Monique's charts list all the possible outcomes?
2. Suppose Dan and Monique recorded 2, 5, and 8 in a different order. Would the possible outcomes be the same? Explain.

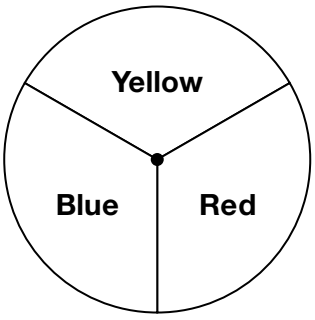
Checking

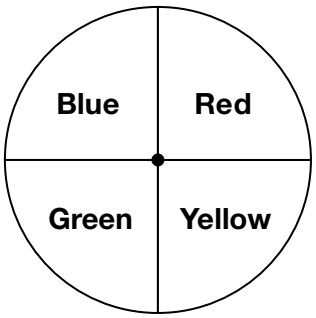
3. Darren put 3 red tiles and 1 blue tile in a bag. He drew 1 tile from the bag, put it back in the bag, and drew again.
   a) Make a chart to list the possible outcomes.
   b) How many possible outcomes are there?
   c) What is the most likely outcome? How does your chart show this?



Practising

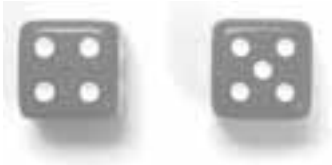
4. Tyler spun each spinner once.





   a) Make a chart to list the possible outcomes.
   b) How many possible outcomes are there?
   c) Which is less likely, or are they just as likely? Explain.
   - Tyler spins the same colour for both spins.
   - Tyler spins green for at least 1 of the 2 spins.

5. Stephanie is rolling these 2 dice.
   a) Make a chart to list the possible outcomes.
   b) How many possible outcomes are there?
   c) What sum is most likely?



B Using Charts

Guided Activity

Masters	• 1 cm Grid Paper, Masters Booklet p. 29

Assessment for Feedback	What You Will See Students Doing...	
Students will	**When Students Understand**	**If Students Misunderstand**
• use area models to determine possible outcomes for an experiment	• Students will create and interpret charts correctly to show each possible outcome of an experiment.	• If students have difficulty interpreting their charts, suggest colouring squares in the charts to show comparisons.

1. Introduction (Whole Class) ▸ 5–10 min

Ask students about using an organized list to list the possible outcomes for spinning two spinners. Ask them whether it matters which spinner you start with. (No, the possible outcomes are the same.)

2. Teaching and Learning (Whole Class/Pairs) ▸ 15–20 min

Draw students' attention to Lesson 13B. Ensure they know the difference between even and odd numbers. Read the central question. Ask students to compare how Dan and Monique started their charts. Elicit from students that both charts show the same data, but Monique added the numbers on the spinners. Make sure students understand why the grid format shows all possible outcomes (3 possibilities × 3 possibilities = 9 outcomes). Provide grid paper and have students complete prompts A to C in pairs.

Reflecting Use these questions to ensure that students understand how to make and interpret the possible outcomes listed in the charts.

Sample Discourse

1. • *The only possible outcomes for each spin are 2, 5, and 8. Each chart shows these outcomes across the top and along the side. All the combinations are in the chart.*

2. • *Yes, the same numbers would be in the charts.*

3. Consolidation ▸ 25–30 min

Checking (Pairs)

3. Students might use the words *red* and *blue*, or the letters *R* and *B*.

Practising (Individual)

4.–5. Provide grid paper for the charts.

4. Use Assessment Tool 8, Masters Booklet p.10, to assess answers to this key assessment question.

Closing (Whole Class)

Discuss with students whether they prefer to use organized lists or charts to list all possible outcomes for an experiment, and to explain why.

Answers

A. Dan's chart

	2	**5**	**8**
2	2, 2	2, 5	2, 8
5	5, 2	5, 5	5, 8
8	8, 2	8, 5	8, 8

Monique's chart

	2	**5**	**8**
2	4	7	10
5	7	10	13
8	10	13	16

There are 9 possible outcomes.

B. 5

C. More likely. More possible outcomes are even than odd.

1.–2. See sample answers under Reflecting.

3. a) Possible Draws of 2 Tiles

	R	**R**	**R**	**B**
R	R, R	R, R	R, R	R, B
R	R, R	R, R	R, R	R, B
R	R, R	R, R	R, R	R, B
B	B, R	B, R	B, R	B,B

b) 16

c) 2 red tiles; For example, more possible outcomes show 2 red tiles than any others.

4. a) Possible Spins of 2 Spinners

	Y	**R**	**B**
Y	Y, Y	Y, R	Y, B
R	R, Y	R, R	R, B
Y	Y, Y	Y, R	Y, B
G	G, Y	G, R	G, B

b) 12

c) Y, R. For example, there are more yellow/red combinations in the chart than any others

6. Possible Rolls of 2 Dice

	1	**2**	**3**	**4**	**5**	**6**
1	1,1	1,2	1,3	1,4	1,5	1,6
2	2,1	2,2	2,3	2,4	2,5	2,6
3	3,1	3,2	3,3	3,4	3,5	3,6
4	4,1	4,2	4,3	4,4	4,5	4,6
5	5,1	5,2	5,3	5,4	5,5	5,6
6	6,1	6,2	6,3	6,4	6,5	6,6

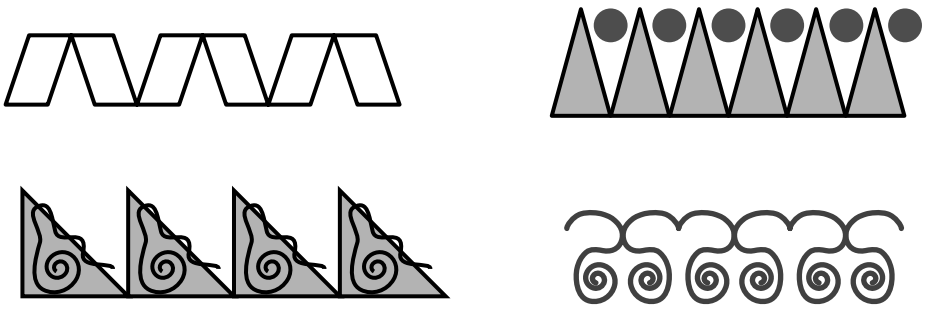
b) 36

c) 7

Chapter Task

Frieze Patterns

Akiko and Jasleen designed frieze patterns to stencil on their bedroom walls. Frieze patterns are horizontal patterns that repeat in one direction.



? How can you make frieze patterns?

A. Sketch a shape on grid paper. Draw a horizontal line that just touches the bottom of the shape.

B. Translate your shape along the line to make a pattern.

C. Repeat Part A. Reflect your shape to make another horizontal pattern.

D. Make a frieze pattern that uses both translations and reflections.

E. Describe your frieze patterns.

Task Checklist
☑ Did you include a drawing of the shape you started with?
☑ Did you include examples of your completed patterns?
☑ Did you use math language?

Chapter Task

Frieze Patterns

Use this task as an opportunity for performance assessment to give you a sense of students' ability to apply transformations in a pattern and describe transformational concepts.

Materials	• pencil crayons, paper
Masters	• 1 cm grid paper, Masters Booklet p. 29

Introducing the Chapter Task
(Whole Class) ▸ 5–10 min

Show students examples of frieze patterns. Many are available on the Internet. Alternatively, you can photocopy a frieze pattern onto an overhead transparency. Discuss the patterns, asking students to identify the transformations used in the pattern.

Using the Chapter Task
(Individual) ▸ 35–50 min

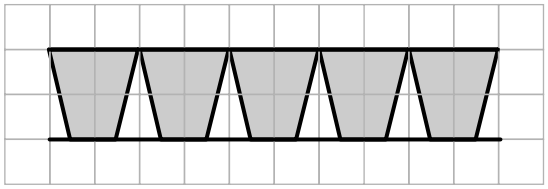
Together, read all the information in the Chapter Task. Point out that the Task Checklist shows reminders about how to achieve a proper solution.

Students may work through the task independently. Encourage students to use pencil crayons and grid paper to draw their patterns.

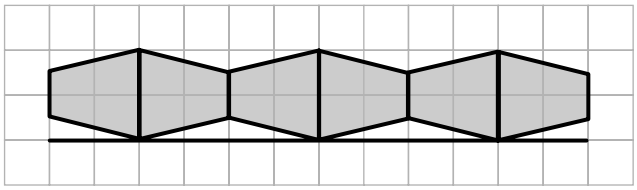
While students are working, observe and/or interview individuals to see how they are interpreting and carrying out the task. Determine if errors are related to difficulty representing the pattern or a misunderstanding of the concepts.

Answers

A. & B. For example,



C. For example,



D. For example,